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frontispiece

Darkness at noon in Pittsburgh 15 years ago prompted the city to clear its air, but complex air pollution still challenges civic leaders everywhere (see p. 914).

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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PUBLIC HEALTH SERVICE
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A Controlled Evaluation of Mass Surveys for Tuberculosis and Heart Disease

PHILIP E. ENTERLINE, M.A., and BERNARD KORDAN, M.D.

A BASIC ASSUMPTION underlying mass casefinding programs is that those persons with disease who are detected are "better off" than they would have been had they not been detected. This assumption has never been completely tested, primarily because of the difficulty of obtaining a control group. A control group would consist of randomly selected persons participating in the casefinding program whose screening tests are positive but who are not advised of these results and are allowed to go on their way to be discovered by some other procedure, or possibly are never detected. Since casefinding programs are considered a service, a control group usually cannot be withheld deliberately, for moral and ethical reasons.

It recently became apparent that controls might be obtained for the evaluation of chest X-ray programs without raising questions of propriety or medical ethics. It has been known for some time that there are inconsistencies in interpreting chest photofluorograms (*1–3*); when two readers interpret a series of X-ray films, no matter how similar their training and orientation, some of the films will be selected as positive by one and negative by the other. This same phenomenon has been reported for interpretations of electrocardiograms (*4*) and for examinations of children for tonsillectomy (*5*), and no doubt it could be observed in the application of many medical procedures.

In casefinding programs based on a single reading of photofluorograms, it is possible to identify by reading the films at a later date persons who appear positive but who were considered negative on the first reading. This group, who would not have received any benefits from the casefinding program since their apparent abnormality was not detected, would seem to constitute a control group for testing the assumption that persons whose disease is detected are better off than they would have been otherwise. The procedure would also identify a comparable group of persons considered positive on the initial reading and negative on the second reading. This group would have received whatever benefits casefinding has to offer and would constitute the study group.

Using this procedure for selecting study and control groups, we have examined the mortality experience of X-ray survey participants during a period of approximately 3½ years as an index of the benefits of this type of casefinding program. More than 200,000 photofluorograms taken in two large-scale, commmunitywide surveys, one in Los Angeles City and County, Calif., and the other in Dallas City and County, Tex., were re-read 3 to 5 years after the completion of the surveys. Sponsoring or participating in this study were the Texas and California State Health Departments, the Dallas and Los Angeles City Health Departments, the Dallas City and County and the Los Angeles

Mr. Enterline is chief statistician of the Heart Disease Control Program, Division of Special Health Services, Public Health Service. Dr. Kordan, now assistant clinical professor, radiology staff, University of Southern California School of Medicine, was during the time of this study chief of Radiology Services, Division of Special Health Services.

County Tuberculosis Associations, the Los Angeles County X-ray Survey Foundation, and the Public Health Service.

The second readings of the X-ray films were done by physicians with training and orientation similar to that of the original readers. In neither instance were the readers qualified as radiologists, although they had received training in reading chest photofluorograms, with emphasis on the detection of tuberculosis.

The second readings were not in many instances done by the same physicians as those who did the first. Moreover, the conditions of the second readings were quite different from those of the first. The criteria used for classifying abnormalities on the two readings therefore probably differed. For this reason, one of us (B. K.), a radiologist, re-read all films called positive on only one of the two readings and prepared a detailed description of any abnormalities observed. He reviewed the films with the knowledge that one of two readers had considered them positive but without knowing whether it had been considered positive on the first or second reading.

In the final selection of films for the study and control groups, only the radiologist's interpretations were used. Relying on a single reader's observations provides some assurance that the same criteria were used to describe abnormalities for both groups. For example, it is possible that tuberculoma was defined somewhat differently by the first and second sets of readers. Having a third reader define tuberculoma for both the study and control groups and using only his readings in comparing the two groups tend to minimize the effect of any differences in criteria. In addition, using only the films designated positive by the radiologist increases the likelihood that the abnormalities were truly pathological. The films called positive by the radiologist are, in fact, films that have been considered positive by two out of three readers.

The results of the first reading, the second reading, and the radiologist's review are shown in table 1. The first and second readings were made at about the same level of suspicion: 7,644 films (3,670+3,974) were considered positive at the time of the surveys, and 7,612 films (3,974+3,638) were considered positive on the second reading. The percentages of the positive films confirmed by the radiologist were about the same for the two readings, 87.5 for the first and 85.0 for the second.

The percentage confirmation for the second reading excludes 379 of the Los Angeles films not read by the radiologist. These films were not read because the names of the persons, essential for obtaining mortality information, were not legible on the photofluorograms. Since the entire file of records for 1,700,000 persons examined in this survey was in alphabetical order, it was virtually impossible to identify individuals from the film number (which was legible). Omission of these films should not bias the study results since the illegibility of the name was due to poor positioning of the survey records in the photo-identifier of the X-ray machines, a circumstance

Table 1. Results of re-reading 70 mm. photofluorograms taken in two communitywide chest X-ray programs

Survey area	Total films re-read	Positive on first reading only		Positive on both readings	Positive on second reading only	
		Total	Confirmed by radiologist [1]		Total	Confirmed by radiologist [2]
Both surveys	208, 555	3, 670	3, 179	3, 974	[3] 3, 638	2, 772
Los Angeles	108, 409	1, 883	1, 647	2, 207	[3] 1, 964	1, 488
Dallas	100, 146	1, 787	1, 532	1, 767	1, 674	1, 284

[1] The study group, that is, persons given the "benefits" of casefinding.
[2] The control group, that is, persons from whom the benefits of casefinding were withheld.
[3] 379 of these films were not reviewed by the radiologist.

Table 2. Type and activity of tuberculosis noted by radiologist

Type and activity	Los Angeles				Dallas			
	Study group		Control group		Study group		Control group	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All tuberculosis	1,017	100.0	732	100.0	407	100.0	241	100.0
Healed primary	64	6.3	38	5.2	0	0	1	0.4
Minimal, probably active	22	2.2	8	1.1	17	4.2	10	4.1
Minimal, activity undetermined	172	16.9	87	11.9	50	12.3	38	15.8
Minimal, probably inactive	708	69.6	549	75.0	136	33.4	125	51.9
Tuberculoma	50	4.9	45	6.1	204	50.1	65	27.0
Other and suspected	1	.1	5	.7	0	0	1	.4

that should not be correlated with variables under study.

The names of all persons whose films were considered positive by the radiologist were checked against the files of the death certificates maintained by the State health departments of California and Texas. In this way death rates were derived for the study and the control groups. Care was taken to provide the same information for each group in checking against files of death certificates. The mortality rates derived from this procedure covered approximately a 4½-year period for Los Angeles and a 2½-year period for Dallas.

Despite the fact that about the same percentages of films were probably positive on the first and second readings, the kinds of disease in the study and control groups were, in the opinion of the radiologist, somewhat different. Since the probability of death within stated intervals varies from one disease to another, the mortality experience is presented separately for each suspected disease grouping.

Tuberculosis Suspects

A description of the films that the radiologist believed showed evidence of tuberculosis appears in table 2. The differences in the type and activity of tuberculosis in the two groups are important to the study insofar as they affect the mortality experience of persons with suspected tuberculous lesions.

For the Los Angeles films, the differences

Table 3. Number of tuberculosis suspects and deaths [1] observed in Los Angeles and Dallas, by age and sex

Age	Study group				Control group			
	Male		Female		Male		Female	
	Suspects	Deaths	Suspects	Deaths	Suspects	Deaths	Suspects	Deaths
All ages	620	23	804	18	456	30	517	23
15–24	46	0	52	0	29	0	24	0
25–34	88	2	114	0	50	0	45	0
35–44	114	2	151	2	68	0	79	0
45–54	123	5	193	5	99	3	86	2
55–64	136	6	166	4	96	13	119	7
65–74	85	8	103	4	78	8	113	6
75 and over	28	0	25	3	36	6	51	8

[1] Excluding 3 deaths due to violence.

were slight. Because of a slightly greater percentage of probably active lesions in the study group, its mortality rate would probably be somewhat higher than that of the control group. It is to be expected that persons with lesions detected in a casefinding survey would have a lower mortality rate (because of the medical and nursing care subsequently provided) than those whose lesions are not detected. Thus, the presence of a greater percentage of probably active lesions in the study group would tend to minimize the difference in mortality between these two groups, and would make conservative any estimates regarding benefits to tuberculous individuals resulting from discovery in chest X-ray surveys. It was decided, therefore, not to make adjustments for differences in the types of tuberculosis included in the study and control groups in Los Angeles.

For the same reason, no adjustment will be made for an even more important difference in types of abnormalities present in the study and control groups in Dallas. Here the difference was due almost entirely to the preponderance of tuberculomas in the study group, and the presence of these would tend to raise the death rate in this group.

The number of tuberculosis suspects and the number of deaths among them for the study and control groups are given in table 3. Adjusted death rates for broad age groups are shown in figure 1. The death rates within these broad age groups have been adjusted for age (10-year groupings), sex, and race (white and nonwhite) differences between the study and control groups. The adjustment was made by the direct method using a standard population consisting of the sum of the study and control group populations. Because the number of

Figure 1. Mortality experience for tuberculosis suspects: percentages adjusted for age-sex-race differences within age groupings.

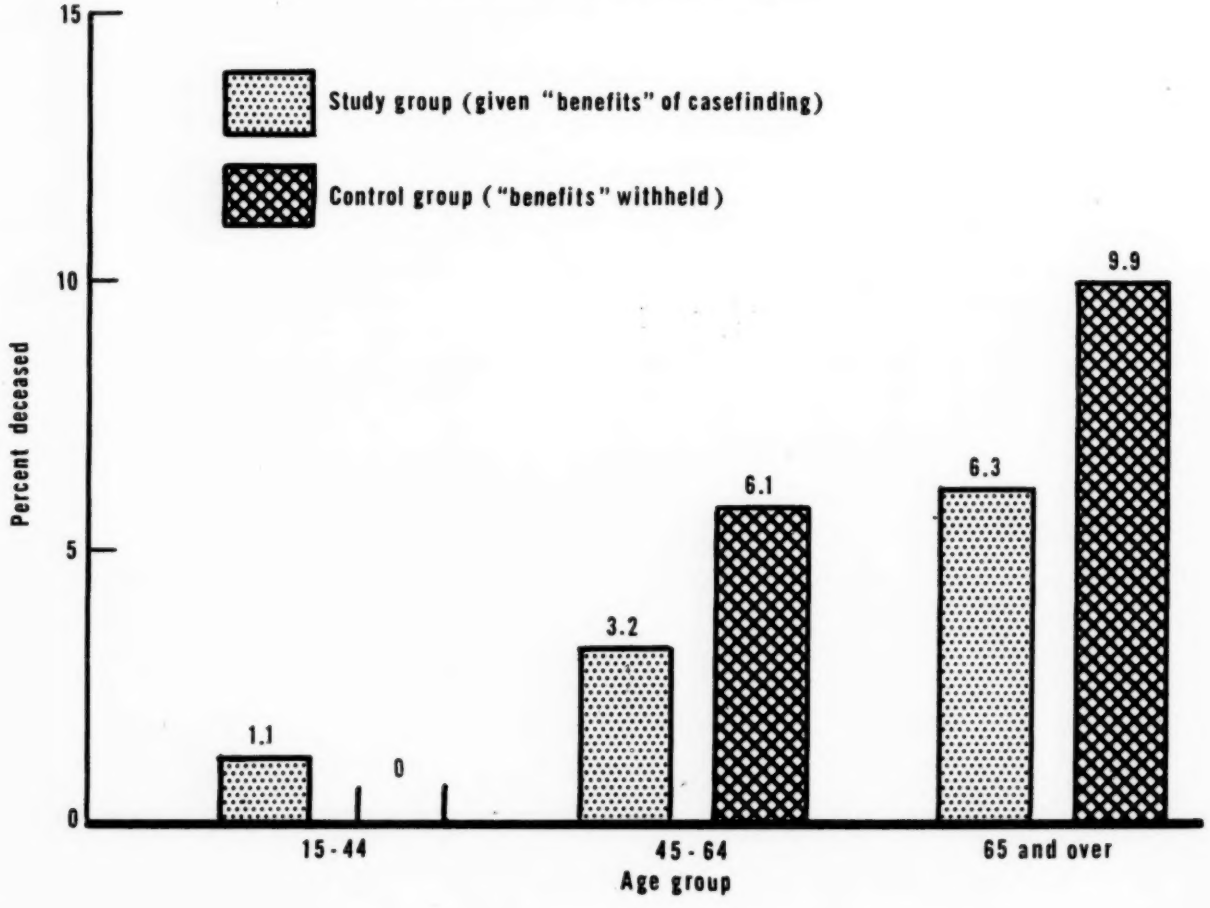

Table 4. Cause of death for tuberculosis suspects, Los Angeles and Dallas

Cause of death	Total	Study group	Control group
All causes	97	43	54
Tuberculosis	1	1	0
Malignant neoplasms	19	13	6
Cardiovascular disease [1]	62	21	41
Vascular lesions of C. N. S.	8	1	7
Diseases of the heart	52	18	34
Arteriosclerotic heart disease	40	13	27
Hypertension with heart disease	6	2	4
Other heart disease	6	3	3
Other cardiovascular disease [1]	2	2	0
Accidents, suicide, homicide	3	2	1
All other causes	12	6	6

[1] Includes 1 death from cardiovascular syphilis.

deaths is very small, the Los Angeles and Dallas data have been combined. The results for the combined groups appear to be approximated when each city-county group is considered separately.

In the age groups 45–64 and 65 and over, persons with X-ray evidence of tuberculosis who were given the "benefits" of casefinding had considerably lower death rates than those who were not. The difference in the age group 45–64 is statistically significant at the 5 percent level, using a one-tailed test of the hypothesis that the death rates were the same ($P=0.0274$). Whether the absence of deaths in the control groups aged 15–44 has meaning or is due to the small number (295) of persons in these groups cannot be determined. The age-sex-race-adjusted death rate for all ages was 3.13 per 100 for the study group during the 2½- to 4½-year period, or about a third lower than the comparable rate of 4.73 per 100 for the control group. This difference is statistically significant at the 5 percent level (one-tailed test, $P=0.0262$).

Only one of the deaths observed among the tuberculosis suspects was coded to tuberculosis as the underlying cause (table 4). Two-thirds were ascribed to cardiovascular disease. Death rates for all causes were as high as or higher than the expected rate, based on death rates observed in the United States in 1950, in all age groups except 65 and over. Considering that all persons in this study were in sufficiently good health to participate in a communitywide chest X-ray program (suggesting that the expected deaths might be somewhat lower than for the United States as a whole) and that the procedures used in matching survey records with death certificates probably caused an understatement of the true death rates, the abnormalities discovered on the X-ray films undoubtedly had an effect on the mortality experience.

Any reduction in death rates among those suspected of having disease would, of course, be the result of medical and nursing care given them. In both Los Angeles and Dallas, followup of tuberculosis suspects was fairly complete. While data were not obtained spe-

Table 5. Type and degree of cardiovascular abnormality noted by radiologist

Type and degree of enlargement	Los Angeles				Dallas			
	Study group		Control group		Study group		Control group	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All cardiovascular abnormalities	654		811		534		587	
Cardiac enlargement (percent)	412	100.0	564	100.0	325	100.0	363	100.0
10–20 (minimal)	298	72.3	357	63.3	223	68.6	245	67.5
20–40 (moderate)	94	22.8	159	28.2	87	26.8	93	25.6
40 or more (marked)	20	4.9	48	8.5	15	4.6	25	6.9
Other cardiovascular abnormalities [1]	242		247		209		224	

[1] Without heart enlargement.

cifically on the extent of followup and treatment given the study group in this report, it is known that for all tuberculosis suspects referred, a final diagnosis was received by the health department on 90 percent in Los Angeles and on 81 percent in Dallas.

Cardiovascular Disease Suspects

The readings for the films in which the radiologist found evidence of a cardiovascular abnormality are shown in table 5. For films from Los Angeles there was a greater degree of heart enlargement in the control group than in the study group. Thus, a higher mortality rate might be expected in the control group even if there were no benefits derived from casefinding. This difference in degree of heart enlargement was associated with a difference in the age distribution of the Los Angeles population and was compensated for by an age adjustment of the death rates.

Table 6 gives the number of cardiovascular suspects and the number of deaths for the study and control groups, and figure 2 shows death rates for broad age groups. As in figure 1, the rates have been adjusted for age, sex, and race differences in the two populations. Of the total 213 deaths observed none was due to tuberculosis; 156, or 75 percent, were due to cardiovascular-renal disease (table 7).

In each age group death rates were lower for those persons with suspected cardiovascular abnormalities given the benefits of casefinding than for the corresponding control group. None of the differences is statistically significant, however. The age-sex-race-adjusted death rate for all ages in the group of cardiovascular suspects given the benefits of discovery in a chest X-ray program was 7.16 per 100, or

Figure 2. Mortality experience for cardiovascular disease suspects: percentages adjusted for age-sex-race differences within age groupings.

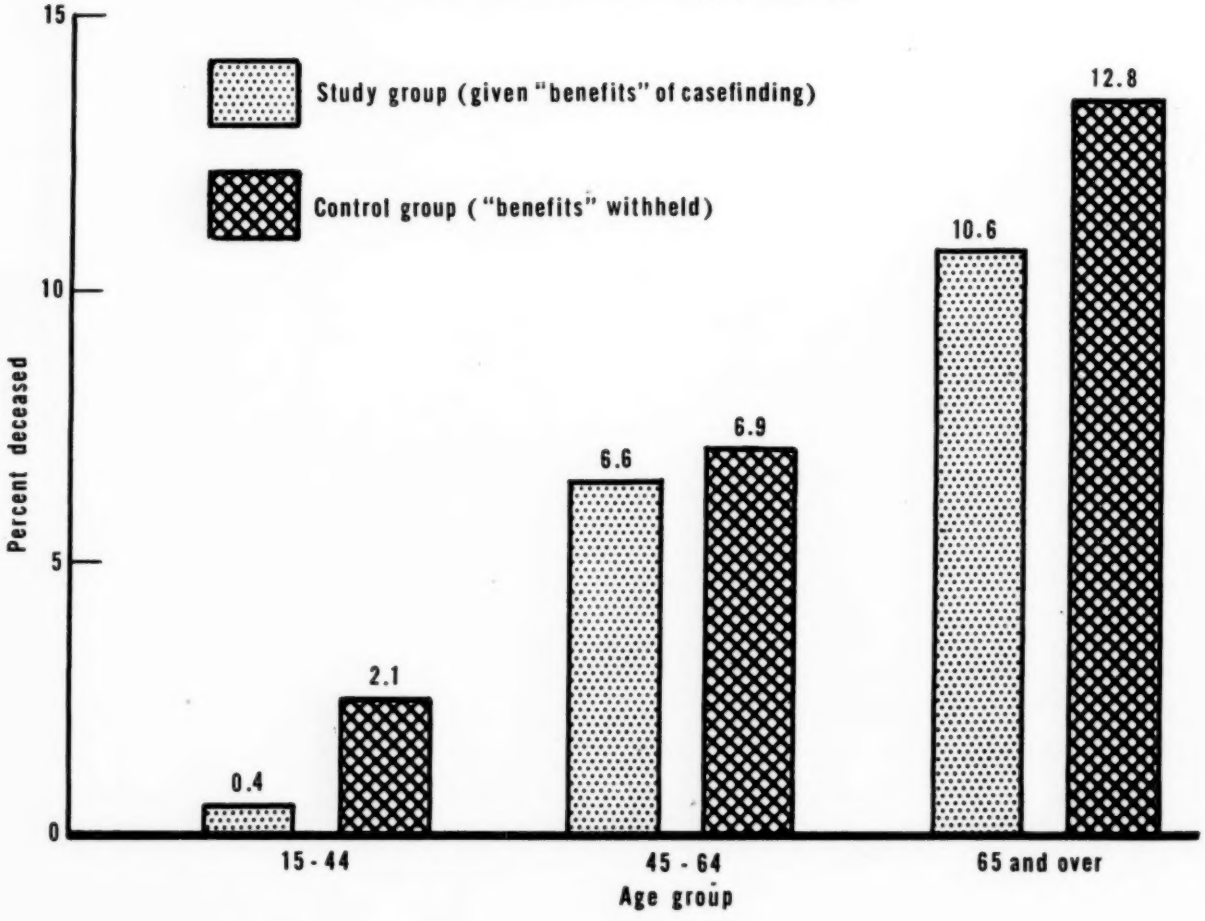

Table 6. Number of cardiovascular disease suspects and deaths [1] observed in Los Angeles and Dallas, by age and sex

Ages	Study group				Control group			
	Male		Female		Male		Female	
	Suspects	Deaths	Suspects	Deaths	Suspects	Deaths	Suspects	Deaths
All ages	480	42	760	40	497	67	905	60
15–24	17	0	27	0	6	0	16	0
25–34	21	0	50	0	19	1	36	0
35–44	42	1	72	0	27	1	62	2
45–54	85	6	188	8	88	9	180	3
55–64	148	17	202	10	144	22	235	11
65–74	110	10	174	15	143	23	266	23
75 and over	57	8	47	7	70	11	110	21

[1] Excluding 4 deaths due to violence.

about 15 percent lower than the comparable rate of 8.39 per 100 for the group of cardiovascular suspects overlooked in the survey. This difference is not statistically significant (one-tailed test, $P=0.1190$).

Again, any benefit to persons suspected of having a cardiovascular abnormality would presumably result from medical and nursing care. In Los Angeles, a followup program was established for cardiovascular suspects. Of those considered abnormal on a confirmatory 70 mm. X-ray, a diagnostic report was obtained by the health department on 78 percent (*6*). As with the tuberculosis suspects, data were not obtained specifically on the extent of followup and treatment given the study group used in this report. In Dallas, persons with abnormal photofluorograms were referred to their physicians for diagnosis and treatment, but no intensive followup was made by the health department to obtain diagnostic reports.

Table 7. Cause of death for cardiovascular disease suspects, Los Angeles and Dallas

Cause of death	Total	Study group	Control group
All causes	213	86	127
Malignant neoplasms	29	13	16
Cardiovascular disease [1]	156	57	99
Vascular lesions of C. N. S.	36	13	23
Diseases of the heart	116	42	74
Rheumatic heart disease	7	2	5
Arteriosclerotic heart disease	86	31	55
Hypertension with heart disease	13	6	7
Other heart disease	10	3	7
Other cardiovascular disease [1]	4	2	2
Accidents, suicide, homicide	4	4	0
All other causes	24	12	12

[1] Includes 1 death from chronic nephritis.

Other Diseases

There were too few cases in any other disease category to make analysis productive. There were, for example, only 411 photofluorograms on which the presence of a tumor was suspected by the radiologist. Of these, 231 were detected in the X-ray surveys but not on re-reading, and 7, or 3 percent, died during the followup period. Of 180 missed in the survey but detected on re-reading, 7, or about 4 percent, died.

Discussion

Theoretically, it was possible in this study to make the study and control groups identical (except for chance variation) by exact matching of all factors that could cause bias between the first and second film readings. These factors were the abnormalities appearing on the film itself and the person's age, sex, and race. Since no other information was available to

the readers, no other factors could influence their decision on a particular film. Differences in age-sex-race distributions were compensated for by adjustment of the death rates, while effects of differences in criteria for classifying abnormalities among film readers were minimized by having the films reviewed independently and classified by a third reader.

Even with exact matching of the study and control groups, another factor that might affect the observed death rates is the mobility of the populations. Only files of death certificates in California and Texas were checked; hence, differences in death rates might have been due to a greater tendency for persons in the study group than for persons in the control group to die in another State. To check on this possibility, death rates observed during the first calendar year following the chest X-ray programs were compared for the study and control groups. Since death certificates for persons living in a State less than a year are allocated to the State of previous residence, the first year's mortality experience should be relatively free of bias due to departure from the State. It was found that differences in death rates during the first year were of about the same magnitude for the tuberculosis suspects and for the cardiovascular disease suspects as differences for the entire followup period. It would appear, therefore, that the lower death rate reported in the study group was not due to a larger out-migration of that group.

The fact that the control group was sent a negative report creates certain misgivings in making inferences as to the expected reduction in mortality for the tuberculosis suspects. While this report stated simply that the film "appeared satisfactory" and recommended an annual chest X-ray film, it may have deferred diagnosis and thus have worked to the disadvantage of the individual involved. There is no way of estimating the importance of this factor from the available data. If it exists, it may be offset by the imperfect matching for pathology between the study and control groups. As was noted above, this imperfect matching should have made the estimate of a third reduction in mortality conservative.

The problem of the negative notification is probably not so important for the cardiovascular disease group, since the chest X-ray surveys used for this study were not generally publicized as casefinding devices for heart disease. Thus, receipt of a negative notification was not likely to be interpreted as absence of heart disease.

Whether estimates derived here of the extent to which individuals are better off as the result of participating in chest X-ray programs apply to all those identified in these programs or only to those persons with obscure or equivocal lesions is problematical. It might be argued that, if the benefits in casefinding accrue largely because the disease found is in an early stage, and therefore is readily amenable to treatment, one would expect that persons with the very type of lesion with which this study is concerned would receive the greatest benefit.

This argument is probably more valid for cardiovascular disease than for tuberculosis. Under current treatment procedures for tuberculosis it is likely that nearly all clinical cases detected in a chest X-ray program benefit and that, in terms of averting death in the immediate future, persons with advanced disease benefit more than those with minimal disease.

From a statistical standpoint evidence of any benefit derived from the discovery of cardiovascular disease on chest X-ray surveys is weak. For tuberculosis, on the other hand, the results seem fairly conclusive. Possibly even larger differences in death rates would have been observed if it had been possible to reduce the study groups to the somewhat smaller number who actually received medical care and if appropriate control groups could have been identified for comparison. The study groups used here were, of course, diluted by some persons who were either considered essentially negative when a confirmatory film was taken or who were not kept under medical observation and treatment for other reasons.

Summary

A study was undertaken to test the assumption that persons with disease who are detected in casefinding programs are "better off" than they would have been had they not been detected.

A study group and a control group were constructed on the basis of a second reading several years later of 208,555 70 mm. photofluorograms taken in two communitywide chest X-ray surveys. This second reading made possible the identification of 3,638 persons considered negative at the time of the survey but positive when the films were re-read and 3,670 persons considered positive at the time of the survey and negative when the films were re-read. Of those considered negative at the time of the survey but positive on second reading, a reviewing radiologist considered 3,179 as positive (control group). Of those considered positive at the time of the survey but negative on second reading, he considered 2,772 as positive (study group). The mortality experience of these two groups was then compared.

For persons whose chest X-ray films showed evidence of tuberculosis, the death rate was about a third lower in the study group than in the control group ($P=0.0262$). For persons whose chest X-ray films showed evidence of cardiovascular disease, the death rate was about 15 percent lower in the study group than in the control group ($P=0.1190$).

These differences may be considered rough estimates of the benefits of chest X-ray programs.

Mimeographed copies of a more detailed report of this study, including additional tables, are available from Philip E. Enterline, Heart Disease Control Program, Division of Special Health Services, Public Health Service.

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New Division at National Institutes of Health

A Division of General Medical Sciences, headed by Dr. G. Halsey Hunt, has been formed at the Public Health Service's National Institutes of Health. The new division will administer research grants in the basic sciences and other fields, support training in the same fields through fellowships and training grants to colleges, and administer the Center for Aging Research. The first two functions have been transferred from the Division of Research Grants; the third from the National Heart Institute.

In line with these changes, the Division of Research Grants will study and evaluate all research grant and fellowship programs at the National Institutes of Health. It will continue to review, for all institutes and divisions, applications for grants and fellowship awards, and continue to process and pay grant and award funds. Dr. Ernest M. Allen will continue as chief of the Division of Research Grants.

We look to the World Health Organization with confidence as a proven instrument through which the nations and the peoples of the world can combine their efforts, in friendship, toward the building of true peace.

—Dwight D. Eisenhower.

Eleventh World Health Assembly

The Eleventh World Health Assembly, meeting in Minneapolis, Minn., May 28–June 13, 1958, adopted a 1959 public health program of 800 projects, touching nearly every country and territory in the world. Delegates of the 88 member states of the World Health Organization voted a budget of $14,287,600 to carry out this work.

Major Assembly actions provided for the extension and intensification of the global eradication of malaria, a comprehensive WHO undertaking in the health aspects of atomic energy, measures for the worldwide eradication of smallpox, greater emphasis on research, and studies in sports medicine.

Malaria Eradication

Delegates reported that malaria eradication is being extended and is underway in 76 countries, containing one-third of the world population. However, because much greater international financing is essential to the success of this campaign, the Assembly authorized the Director-General to seek funds from foundations, industry, labor organizations, institutions, and individuals, as well as governments. WHO's Malaria Eradication Special Account contains only a little more than $5 million, sufficient only for 1958 activities. UNICEF, which contributed $8 million to this effort in 1957 and in 1958 and has earmarked a similar amount for 1959, will halve its contribution in 1960.

The delegate of the Soviet Union announced that his government would donate 1,000 tons of DDT to WHO and could make available technically qualified experts to promote eradication of malaria. The Assembly requested the Organization to extend research, particularly in the phenomenon of mosquito resistance to insecticides.

Health Aspects of Atomic Energy

A resolution, unanimously approved by the Assembly, directs the Director-General to investigate methods in dealing with health hazards implicit in the peaceful uses of atomic energy. He is to report especially on methods for ascertaining and recording the exposure of individuals to all radiation sources, for determining the relationship between radiation dosage and congenital defects, and for notifying public health authorities of congenital defects which could be caused by radiation.

The resolution also opens the way for the Director-General to aid underdeveloped countries in the use of radionuclides in medicine, and for a study of the effect of radiation on human heredity and of the relationship of

radiation to health in general. The Assembly requested the Organization to cooperate with the International Atomic Energy Agency in health matters of mutual interest to avoid overlapping or duplication of effort.

Smallpox Eradication

The Director-General was asked to study the possibilities and practical implications of universal smallpox eradication, taking into account financial, administrative, and technical factors. He is to report his findings at the January 1959 meeting of the Organization's Executive Board. Governments throughout the world were urged to continue to fight smallpox with vaccination and revaccination campaigns, and medical scientists were called upon to work toward the production of improved vaccine resistant to the influence of temperature.

The U.S.S.R., which sponsored this resolution, announced that it was donating 25 million doses of smallpox vaccine to WHO; Cuba offered 2 million doses annually. The resolution proposed that WHO carry out preparatory work in 1958 to search for the best methods for worldwide eradication. It recommended mass vaccination in 1959–60 in countries where the principal endemic foci of smallpox exist, and additional vaccination and revaccination in 1961–62 of the population in which the disease persists.

Research

The Assembly requested that a special study be made of the role of WHO in research and of ways in which the Organization might assist more adequately in stimulating and coordinating research and developing research personnel. The United States Government is donating $300,000 to set up studies of ways and means to promote research. Dr. Milton Eisenhower, personal representative of the President, made this offer in his address to the Tenth Anniversary Commemorative Session of the World Health Organization.

Sports Medicine

The Assembly called for studies to be made in collaboration with the International Federation of Sports Medicine, a nongovernmental agency which has official relations with WHO. The studies will include the role of exercise and physical training in a constructive health program. The Netherlands and Canada opposed the action on the ground that the Organization's budget is too slender to divert funds from more urgent needs.

Poliomyelitis

A number of countries reported on the successful use of the Salk killed-virus vaccine. Some delegates complained that the high cost of the vaccine prevented its extensive popular use in their countries. The Assembly showed interest in extensive experiments underway in immunization through the use of orally administered, attenuated live-virus vaccine.

Survey of World Health

The Organization has compiled a comprehensive survey covering 1954–56 of health conditions throughout the world. It contains descriptions and appraisals of health programs completed or in progress in 157 countries and territories embracing 76 percent of the world's population. The Assembly asked that a second report with information covering 1957–60 be ready for submission to the 1962 World Health Assembly.

Voting Future Budgets

The Assembly decided that future Organization budgets must be approved by a two-thirds majority rather than a simple majority. During the debate the Director-General said that this idea had been considered and rejected by the framers of the WHO constitution. He saw in this step the danger of creating a precedent, changing an essentially organizational matter merely by altering the rules of procedure. The prevailing view was that a two-thirds majority would strengthen the hands of representatives when they seek budget funds for the Organization in their respective countries.

Elections

The Assembly elected as president for 1 year Dr. Leroy E. Burney, Surgeon General of the Public Health Service (United States); as vice presidents, Dr. J. Anouti, Director-General, Ministry of Public Health (Lebanon),

Three Surgeons General of the Public Health Service, two past and the incumbent, were among delegates to WHO's Tenth Anniversary Commemorative Session in Minneapolis, May 26–28, 1958. From left to right: Dr. Leonard A. Scheele, Dr. Thomas Parran, and Dr. Leroy E. Burney. Dr. Burney presided over the Eleventh World Health Assembly, which met May 28–June 13, 1958. Dr. Scheele is a past president of the Assembly, and Dr. Parran was one of the signers of the original charter of the World Health Organization. The World Health Organization met in this country at the invitation of the United States, following appropriate action by Congress.

Dr. A Sauter, Director of Public Health (Switzerland), and Dr. Tran Vy, Health Minister (Vietnam); as chairman of the Committee on Program and Budget, Prof. N. N. Pesonen, Director-General of the State Medical Board (Finland); and as chairman of the Committee on Administration, Finance and Legal Matters, M. S. Khanachet, member of the Saudi Arabian Legation in Bonn.

Executive Board

The 18-member Executive Board as constituted after elections by the Assembly includes Afghanistan, Australia, Brazil, Canada, Federal Republic of Germany, France, Guatemala, India, Iran, Italy, Liberia, Mexico, Tunisia, U.S.S.R., United Arab Republic, United States of America, United Kingdom, and Vietnam.

Membership and Finances

Membership in the World Health Organization has grown from 26 countries in 1948 to 88 at present. Two new member states are the Federation of Malaya and the United Arab Republic. Czechoslovakia resumed active status in the Organization in 1958.

In addition to the $14,287,600 voted for the 1959 budget, WHO received a supplemental $6 million of United Nations Technical Assistance funds, and nearly $9 million was contributed to the special malaria eradication funds of the Organization and its regional representative, the Pan American Sanitary Bureau. The 1957 collection of contributions from active members reached 97.08 percent, a record in the history of WHO, according to the External Auditor's Report.

The First 12 Years of WHO

THOMAS PARRAN, M.D., LL.D., Sc.D., Dr.P.H.

At the Eleventh World Health Assembly Dr. Thomas Parran received the Leon Bernard Foundation Prize for outstanding achievement in social medicine. The award, established by the League of Nations and administered by WHO, was presented to him in recognition of his contributions to public health in the United States, particularly control programs for venereal disease, tuberculosis, and cancer, and Federal assistance to States for hospital planning and construction.

Dr. Parran, first dean of the Graduate School of Public Health, University of Pittsburgh, and Surgeon General of the Public Health Service from 1936 to 1948, has recently assumed direction of the Avalon Foundation.

Other recipients of the prize have been Prof. René Sand (Belgium), Prof. C.-E. A. Winslow (United States), Dr. Johannes Frandsen (Denmark), Prof. Jacques Parisot (France), Andrija Stampar (Yugoslavia), and Prof. Marcin Kacprzak (Poland).

NO GREATER HONOR can come to anyone in public health and social medicine than to receive the Leon Bernard Foundation award. This is particularly true when one reviews the role of honor of those who have earlier received the award and when one considers that it is voted by the World Health Assembly, representing the world health leaders of our time.

I accept the award with deep gratitude and humility.

My first contact with international health affairs was in 1926, when I was selected as one of 12 young medical officers from 11 different countries to engage in a study tour of Denmark for some months, following which we spent a week in Geneva to report upon our experiences and to learn about the work of the health section of the League of Nations. For me, this was a great educational experience. Since then, I have continued to learn about international health in many capacities. Each of these experiences has broadened my understanding of the needs for, and the possibilities of, international cooperation in the field of health and of technical assistance generally.

In July 1946, at the signing of the constitution of the World Health Organization, I said that we were "signing a Magna Carta for health which will bring into being a World Health Organization unique in its scope, authority, and functions." I ventured to forecast the successive steps which WHO would take during the years ahead. These included "help in healing the wounds of war and eliminating the ancient human plagues, such as malaria and cholera, tuberculosis and syphilis. Prevention of disease is a first objective.

"To attain freedom from want of food is another goal which we may hope to reach by pooling our nutritional knowledge with the food and agricultural efforts of the United Nations.

"A next step toward world health is the positive improvement of health. Higher levels of physical development, a longer, more productive, more vigorous life span will be sought and attained.

"But prevention, treatment, and control of disease should be supplemented by intensive research in the laboratory, at the bedside, and in the field to push back the frontiers of the unknown in the health sciences."

Also, I said, "In our Magna Carta for health, we have ventured to declare that we have a contribution to make to the central world problem of today, which is to help man learn to live harmoniously with his fellow man. In making this proposition, I for one believe that health science must share the task with religion and education."

I concluded by saying, "The World Health Organization is, therefore, a collective instru-

ment which will promote physical and mental vigor, prevent and control disease, expand scientific health knowledge, and contribute to the harmony of human relations. In short, it is a powerful instrument forged for peace."

The goals set for the World Health Organization represented the highest aspirations of the human spirit. Few of us believed that they could be reached fully and in a short time span; but we should never lose sight of them. It is a source of great satisfaction that we have moved "ten steps forward." They have been 10 important steps which might be described more accurately as 10 times 10. That such substantial progress has been made is all the more remarkable when we consider the continued unsettled conditions in world affairs during these past 12 years. For what has been accomplished, primary credit is due to the competent leadership of the first two Directors-General, Dr. G. Brock Chisholm and Dr. M. G. Candau. Credit goes also to the staff in Geneva and in the regional offices, as well as to the delegates to the 11 annual health assemblies and the members of the Executive Board.

In retrospect, I think that a sound decision was taken at the First World Health Assembly to limit the initial objectives and programs to urgent problems of worldwide importance. These were control of malaria and tuberculosis as well as important acute communicable diseases, the improvement of nutrition, measures to promote maternal and child health, and sanitation of the environment.

It is gratifying that the initial programs have been intensified through a somewhat larger central budget and through the Expanded Programme of Technical Assistance, and that the substantial resources of UNICEF have been joined in promoting some of the important objectives of the World Health Organization.

From the outset, education and training have played important roles—8,000 WHO fellowships attest to this—and the more recent concern both of the United Nations and the World Health Organization with atomic energy in relation to health recognizes the importance of this new factor in man's environment.

Because of my preoccupation with the advancement of the health sciences through research and the training of future workers, both in the general field and in a number of its subdivisions, what I have to say will naturally center about this experience.

In May 1957, we held a series of seminars in Pittsburgh as a part of the ceremonies inaugurating our new chancellor and dedicating our new School of Public Health building. The themes were "Contributions of the Sciences to Public Health in the Years Ahead" and "Fusion of the Sciences for Better Health." I shall try to summarize some of the conclusions.

Viewing the sciences in historic perspective, one can detect periodicity. There have been periods of fusion and the reverse, a disintegration of effort. In the earliest period, the natural philosophers were the universal scientists, exploring all of life in order to gain greater knowledge of its meaning. (In the future, as in the past, the philosophers will contribute to our understanding of life, of natural laws, and of the universe.)

In due course, it became possible to study one or another aspect of life and living creatures. This led to specialization by medical research and medical teaching which burgeoned until a specialist came to be defined as a person who knows more and more about less and less. There are signs that this trend is being reversed—that a scientist needs to have more than one skill under one skull—and that future progress lies through a fused spectrum of scientific knowledge. This trend, apparent in medical and public health practice, is to see man and his environment as a whole and especially to interpret the dynamic interactions in these man-environment interrelationships. In short, human ecology.

During recent years the earlier distinction between public health and medicine has been blurred; there has also been a great decrease in the earlier distinction between physical and biological science so that at present there is no boundary within the biological sciences which the physical sciences cannot usefully pass. In this process of infiltration, there is the resulting integration of all biological sciences into a continuous and more meaningful whole. The viruses are a case in point. They are inert chemicals under certain circumstances; under other circumstances, reproducing organisms

with emergingly known genetic behavior, and disease agents of grave seriousness. Who has jurisdiction here? Is it the physical scientist, the biologist, or the physician? Clearly, we need to submerge the old distinctions and preserve the interrelations and wholeness of nature.

There has been a long transition from the primitive ritual of the medicine man to today's medicine of the sciences. The expansion of medical knowledge and teaching in recent years has been dominated by the scientific discipline of medicine itself and by segments of knowledge drawn from other sciences, so that today biological and natural sciences have become the very matrix of medical thought. Physics, chemistry, and biology are its language and tools.

The past century has been called the era of the biological and the physical scientist, but today we may be entering the century of the psychological or of the physiological-sociological-anthropological man. Perhaps in the next century the first half of this one will be noted as the period in which society moved away from its preoccupation with man solely as an economic creature.

Public health has been termed "an applied technology resting upon the joint pillars of natural science and social sciences." During the past century the natural science pillar has been greatly strengthened, but until both the pillars are strong the arch of public health will not be firm. Now, consideration also is being given to the social aspect of the environment, especially as it interacts with biological and physical stresses. Since stress effects are both psychological and physiological, emphasis must be given to fuller understanding of psychological factors in stress and disease reactions.

My colleague, Dr. Robert E. Olson, draws attention to the problems facing public health: "The biochemist who studies the kinetics of a purified enzyme system has only a few variables to control; the physiologist who studies the metabolism of an intact organ in an animal has many more to consider; the physician who studies a disease process in an intact human animal has even more parameters to correlate and attempt to control in the diagnosis and treatment of his patient. But the public health scientist who is studying the behavior of populations is dealing with an infinitely complex situation, to which, in many instances, only statistical solutions are possible."

In the past, certain factors known to affect public health adversely could be engineered out of the physical environment. Today, there is needed a revealing analysis of the social environment which blocks the way of abundant public health. Most of the degenerative diseases, which constitute our major health problems, have psychosocial components. The so-called psychosomatic diseases such as hypertension, peptic ulcer, rheumatoid arthritis, thyrotoxicosis, and schizophrenia have direct psychiatric determinants; others such as obesity, alcoholism, and coronary artery diseases have at least indirect relations to sociocultural patterns of diet, anxiety reduction, and stress.

Public health needs to be increasingly concerned both in research and in teaching with a comprehensive ecologic approach to problems of disease and of health if we are to be successful in understanding better the degenerative diseases and mental illnesses. The clinician must expand his horizon to include the role of the family and the community in relation to the disease problem at hand. By the same token, the public health scientist must not be content solely with statistical solutions and epidemiological inferences in his analysis of these knotty problems. The meeting ground is the interdisciplinary team play of a group from many fields of science, in sympathetic agreement with each other, and with access to the experimental laboratory, the patient, the family and the community, if need be, in the pursuit of the problem under study.

Those of us who use epidemiological and biostatistical methods primarily should remember that acute clinical observation may supply the clue, even though it be made only on one patient. Claude Bernard, French physiologist, once said, "I do not reject the use of statistics, but I condemn not trying to go beyond them" (quoted in the New York Times, E–9, April 13, 1958).

It is recognized that epidemiology does not deal solely with infectious diseases. It was through epidemiological investigations that the nature of pellagra and of goiter was discovered. There is an epidemiology of suicides, of acci-

dents, of cancer, and of atherosclerosis. Some beginnings have been made in the epidemiology of mental health and disease. I have pointed out elsewhere (*1*) the need for intensifying greatly these types of epidemiological studies.

When we have parallel biochemical studies, we may, by the epidemiological method, identify disease-prone individuals in a population before they become sick. Once these individuals with biochemical differences can be identified, it may be possible to control internal factors as well as the external environments and thus retard the progression of disease; almost certainly, there are such psychosocial and nutritional factors. Such knowledge may be to the prevention of degenerative disease what immunization and good sanitary engineering have been to the prevention of communicable diseases.

It is agreed that the behavioral and the biological or biochemical aspects of man are not separated by an impassable gulf.

But in our preoccupation with new and complex problems, public health workers should continue their emphasis upon traditional bases for action. We need also to apply to the newer problems the principles which have been learned from the past.

As one looks back, man has been concerned over the centuries with getting enough food to meet his metabolic needs and controlling his microbiological environments. Neither objective is met for most of the world's people. The continued growth of population, estimated at 1.6 percent per year, may continue to outrun increased food production. Consequently, public health must be concerned with problems of natality as well as with those of mortality.

The economy of scarcity has been superseded by overabundance in the United States and other western nations. Hence, we are concerned with metabolic disorders, obesity, alcoholism, and effects of smoking, which are disorders of excess rather than deficiency. Even the concept of stress as a cause of mental ill health connotes excess—the impact of more challenges than the organism is able to bear. Sir Geoffrey Vickers says, "Our hazards from excess range from excessive nuclear radiation through excessive smoking, to the excessive consumption of ice cream—products which have in common the fact that our superabundance is our own desiring" (*2*).

Recently, George J. Stolnitz has reported on "A Century of International Mortality Trends." He concludes that the rise in life expectancy over the past century probably has been more far-reaching than the gains of the previous 2,000 years; that the increases in western countries in the expectation of life at birth since 1890 have been more than double the gains over the preceding half-century; and that many of the mortality trends in western life changes are "unrepeatable phenomena." It is irrefutable that major gains of the future in lifesaving must come in the ages beyond 60. In documenting this point, Stolnitz calculates that if all mortality before age 45 were eliminated, the resulting gains would be no more than half of the rises in life expectancy at birth since the beginning of this century (*3*).

Each new breakthrough in the health sciences and each shift in living patterns will produce additional tasks for the World Health Organization and for national health services. Certainly, we are agreed that additional responsibilities have been produced by urbanization, by industrialization, by the major threats arising from air pollution, and even from the density of automobiles on the highways. Yet none of the serious problems evoked has been solved.

Added to the familiar environmental hazards is that new factor in man's environment, nuclear fission, and its use for the production of power. The known supply of fossil fuels is inadequate. In the absence of practical methods for harnessing solar energy and for unraveling the secrets of photosynthesis, nuclear power is being developed on a huge scale. This will increase at an ever-accelerating pace with many nations getting into the act but having too little comprehension of the dangers.

The disposition of radioactive garbage poses a whole series of enigmas not yet solved by the nations most technically advanced in nuclear fission. Such problems will confront us increasingly. We must develop the organization and the personnel and, most important of all, acquire the knowledge with which to cope with these problems.

Radiation biology now offers many new fields

for research and for the training of individuals to deal with them. The Graduate School of Public Health at Pittsburgh is pioneering in such a program of research and in the training of new types of specialists who can combine knowledge of the traditional health sciences with the newer knowledge of nuclear technology. This expanded area of health training will be invaluable in maintaining the health of mankind as we enter nuclear competition.

While never losing sight of its long-range goals, the World Health Organization in every situation must build upon what now exists in every country and region; each step forward must be practical in the light of the limitations imposed by traditions, customs, and resources.

It is gratifying to note the trend in many countries to seek the Organization's help in working out long-term plans for a continuing development of their own health services, and the growing willingness of nations to engage in joint action with their neighbors to solve common problems.

In the Director-General's Annual Report for 1955, the importance of strengthening the national health services is stressed. There are indications that nations, large and small, are becoming increasingly aware of the value of self-help in taking responsibility for the long-range development of their own health services, and that they seek aid mainly in three directions: supplies to be used in the worldwide struggle against communicable disease, the strengthening of the services already established, and the raising of standards of education and training of all types of health workers.

Even more attention needs to be given by the World Health Organization and every member state to the collection of more accurate and more comparable health statistics. Without them the course of public health cannot be charted wisely.

I have referred to the worldwide population explosion and the need for health agencies at all levels to be concerned about it, to seek to understand better these complex phenomena, and within religious and cultural contexts to devise programs of research, education, and action to deal better with them.

There are two great drains upon the resources, the manpower, and the accumulation of capital in most countries which detract from human health and well-being: expenditures to provide housing, food, clothing, and other items required for normal living by the too rapidly increasing population, and expenditures for war or the prevention of war, defense.

What a different world we could have if some of these expenditures could be diverted to the better cultivation and development of the human capital, the human resources, in each country. Health, education, recreation, and nutrition are obvious needs. Should not most of these savings be diverted to programs in each country to improve standards of health and well-being, and some funds be made available to the World Health Organization and other specialized agencies?

Specifically, I propose that all member states of the Organization, in addition to their regular contributions, take 2 percent from their annual appropriations for military purposes and use it as an extra contribution to the Expanded Programme of Technical Assistance of the United Nations, in which the World Health Organization should have a substantial share.

With such funds and the sentiment behind them, malaria eradication would be speeded up; smallpox, tuberculosis, syphilis, and yaws would be next to go. In fact, all of the ancient plagues could be conquered within a measurable number of decades. Then WHO could turn its energies more fully to improving nutrition, to promoting physical and mental vigor, to expanding scientific health knowledge, and finally to the most difficult task of all—the improved harmony of human relations.

The substance of the comments in this address was published in California Medicine 88: 411–416, June 1958.

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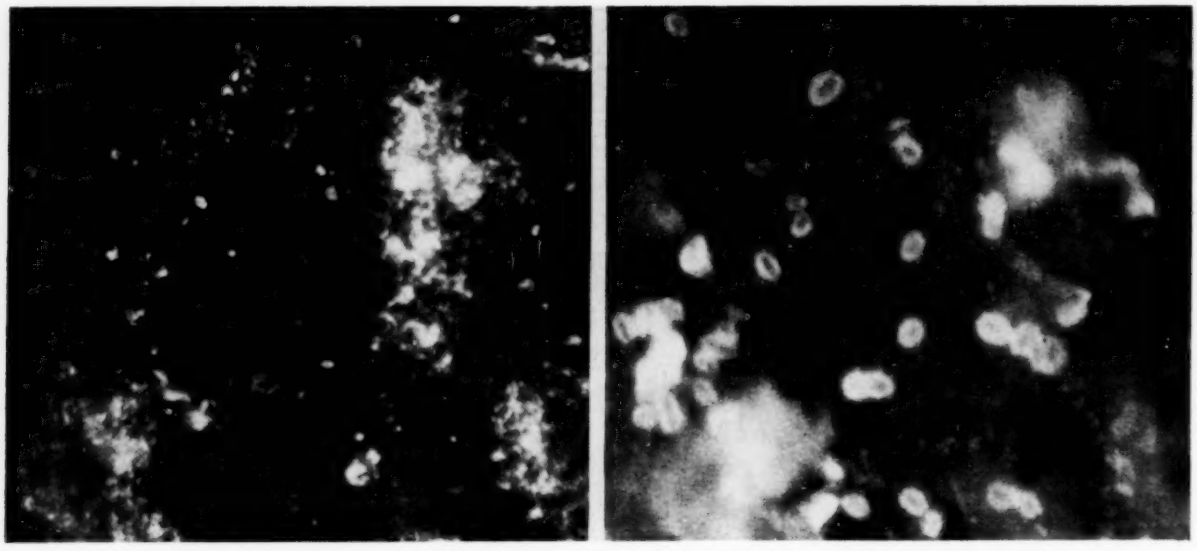


Plague organisms from a mouse spleen smear, which has been stained with fluorescent antibody. On the left side, with visible light, the viewer sees a great deal of material from which it is exceedingly difficult to separate the plague organism; on the right side, with ultraviolet light, only the plague bacteria show up.

FLUORESCENT ANTIBODY TECHNIQUES

Fluorescent antibody techniques for rapid laboratory identification of pathogens, and of antibodies produced in man by these microorganisms, are under development at the Communicable Disease Center of the Public Health Service. These new diagnostic methods, which use a fluorescein dye to "light up" individual disease organisms, promise one day to enable the physician to make an accurate diagnosis of certain communicable diseases within minutes after the patient comes to his office.

In describing these methods, Dr. R. J. Anderson, chief of the Communicable Disease Center, explained that the first step is to "label" with a fluorescent dye a globulin solution containing antibodies specific to certain organisms. When dried smears made from specimens are covered with the tagged antibody solution and observed through a microscope under ultraviolet light, any homologous organisms or their products will fluoresce. The process takes a few hours or less, whereas other methods take 2 or 3 days or even sometimes weeks.

A corollary method detects antibodies rather than the actual pathogenic organisms at stages of infection when the organism is not available for identification.

These quick, relatively simple, versatile laboratory procedures may possibly apply to the identification of pathogens in all kinds of specimens either from the individual patient or from the environment. As the somewhat laborious matter of adapting them to use with different bacteria and viruses and with their respective antibodies is completed, they are expected to take an important place in the work of laboratories all over the country.

Before these procedures can come into general use, several practical problems will have to be solved, Dr. Anderson indicated. Microscopes equipped with the appropriate ultraviolet light will have to be made available, and technicians will have to be trained to use the new methods. Tight budgets also may delay the use of the fluorescent antibody techniques in many localities.

Intensive clinical and epidemiological studies strongly pointed to a common source of acute Salmonella reading infection occurring in more than 300 persons in widely separated areas of the United States during a 12-month period. However, no common source of infection could be identified.

Widespread Salmonella reading Infection of Undetermined Origin

ROBERT H. DRACHMAN, M.D., NORMAN J. PETERSEN, B.S., JOHN R. BORING III, M.S., and FRED J. PAYNE, M.D.

DURING the period from September 1956 through early September 1957, 325 acute sporadic cases and 3 outbreaks of salmonellosis due to *Salmonella reading* occurred in the United States. Previous to this time *S. reading* had been rarely encountered in typing laboratories. Although the epidemiological picture strongly pointed to a common source of infection, none could be identified in spite of intensive study. This "outbreak" is an example of a phenomenon periodically noted by *Salmonella* typing laboratories when, within a few weeks, a relatively large number of cultures are received containing a serotype which has previously been encountered only rarely. This phenomenon is seldom explained except when circumscribed outbreaks of salmonellosis are clearly involved. The salient features of the 1956–57 "outbreak" follow.

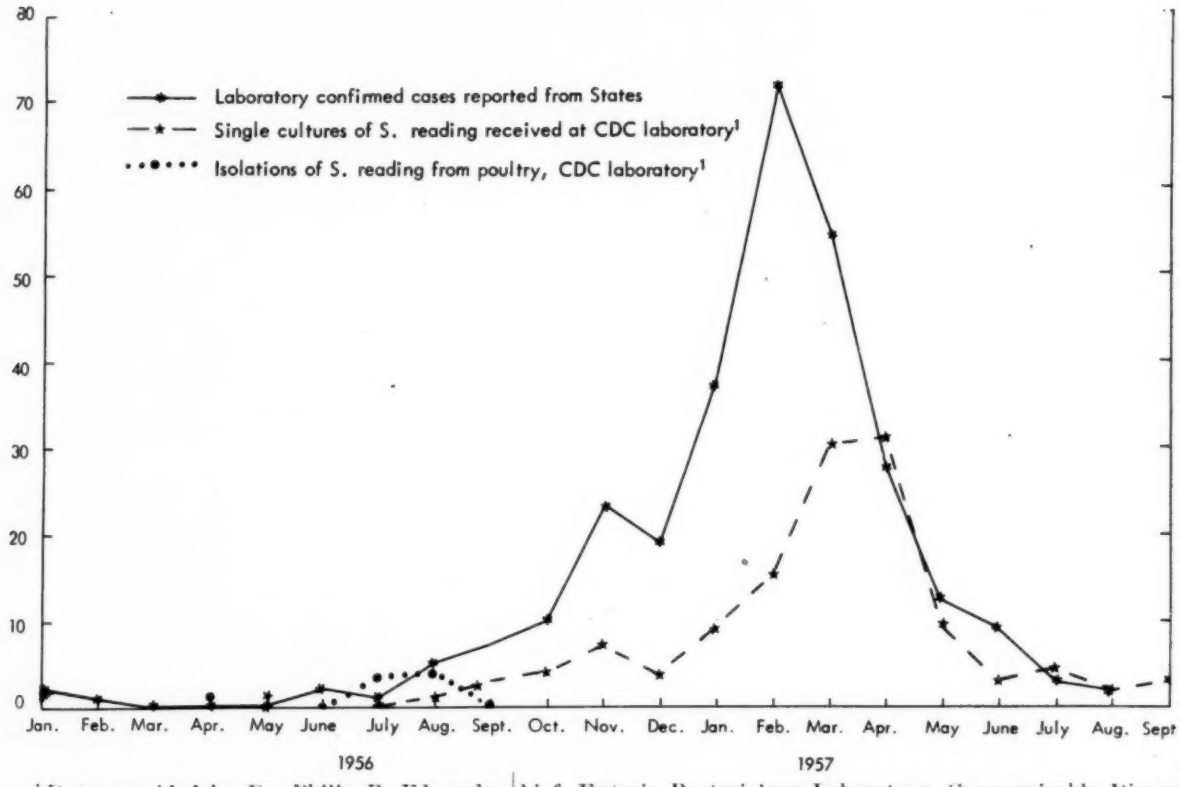
The authors, at the time of the study, were all with the Enteric Disease Investigations Unit, Epidemiology Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Drachman is currently chief of the unit. Mr. Petersen, sanitary engineer epidemiologist, and Dr. Payne, epidemiologist, former chief of the unit, are now with the Phoenix Field Station, Phoenix, Ariz., and Mr. Boring, bacteriologist, is with the department of bacteriology, University of Florida, Gainesville.

The paper was presented in part before the epidemiology section of the American Public Health Association at its annual meeting in Cleveland, Ohio, November 14, 1957.

The "Salmonellosis" Outbreak

In late March of 1957, Dr. Frederick H. Wentworth of the bureau of communicable diseases, Ohio Department of Health, reported 13 isolations of *S. reading*, indicating a sharp increase of this type of *Salmonella* compared with the previous experience of the health department. About half of the isolations were from blood cultures, and all came from children in widely separated areas of the State. Inquiries to Dr. Philip R. Edwards, chief of the Enteric Bacteriology Laboratory, Communicable Disease Center, and to other *Salmonella* typing centers throughout the country revealed a similar recent increase in *S. reading* isolations. Accordingly, a plan for national surveillance was instituted. A summary of available data was distributed to State health officers, epidemiologists, and laboratory directors. Requests were made for the prompt submission of epidemiological data on all instances of *S. reading* infection, with particular attention to pos-

Month of onset of 283 cases of salmonellosis due to Salmonella reading, exclusive of asymptomatic carriers and secondary cases.



[1] Data provided by Dr. Philip R. Edwards, chief, Enteric Bacteriology Laboratory, Communicable Disease Center, Public Health Service, Atlanta, Ga.

sible sources of infection. A standard food history form was prepared and circulated. Several Epidemic Intelligence Service officers worked in cooperation with 11 State health departments in obtaining field data.

The chart shows the month of onset for 283 reported cases of salmonellosis due to *S. reading* for which such information was available. A total of 392 isolations of this type representing repeat cultures, family contacts, and outbreaks was reported during the same period. An early increase in cases is noted in October of 1956 with a peak in February of 1957 and a decline to previous incidence by May of that year.

Table 1 shows the distribution of the reported cases by State and month of onset. In this table, family and other group outbreaks are counted as single episodes. Cases appeared simultaneously in several widely separated areas of the country. No progression of *S. reading* isolations from one geographic area to another is apparent. However, most positive isolations were reported from the northern tier of States. In view of the wide variation in the degree of utilization of laboratory facilities in various areas, no attempt is made to calculate attack rates.

The age distribution of 248 patients with salmonellosis due to *S. reading* for whom age data were given is presented in table 2. Cases are concentrated among infants and children, with 18 percent of the total number under 1 year of age and 11 percent under 6 months. This grouping agrees with the tabulation by MacCready and co-workers of ages for 2,092 patients with *Salmonella* infections in general (*1*).

Clinical and Laboratory Data

Detailed clinical and laboratory data were obtained for 69 patients, and henceforth these will be called the study group. The information is summarized in tables 3–7. Hospital records of 20 patients were abstracted, and health

department records and personal interview data were available for all 69 patients. These patients are probably not representative of persons ill with salmonellosis due to *S. reading* but for prejudicial reasons happened to have been cultured during a bout of gastroenteritis. It is striking that the vast majority of homes visited revealed families of above average income. However, this was merely an impression, and no attempt was made to evaluate the economic status of the families interviewed.

The median age of the study group was 3 years, with a range of from 1 week to 64 years (table 3). In this respect the lower age range of the study group approximated the age distribution of the previously described group of 248 patients. More than half of the patients were hospitalized, with a median hospital stay of 8 days (table 3). Patients were reported to have been severely ill in 53 percent of the cases, 27 percent were moderately ill, and 20 percent were mildly ill (table 4). These were subjective impressions by patients and were not quantitated objectively. Symptoms persisted for a median of 7 days although the time was some-

Table 1. Distribution of 283 cases [1] of salmonellosis due to Salmonella reading, by State and month of onset, January 1956–July 1957

State	1956					1957						
	January–August	September	October	November	December	January	February	March	April	May	June	July
United States	12	7	10	23	19	37	71	54	26	12	9	3
New England:												
Maine							1					
Vermont					1							
Massachusetts						5	4	2	1			
Connecticut	1	2	1	3	2	2	1	2	1	1	2	1
Middle Atlantic:												
New York	4	3	2	1	3	9	7	6	6	1		
Pennsylvania							2					
East North Central:												
Ohio						1	11	8	4		1	
Illinois	1	1	2	2		1		3	1			
Michigan			2	3	2	6	13	5				
Wisconsin	1		1	5	2	2	2		2	1		
West North Central:												
Minnesota						2	4	5	1	1		
Iowa					1		1	3				
Missouri				2	1							
North Dakota					1							
Kansas												2
South Atlantic:												
Maryland			1						1	5		
Virginia						1	1	1				
North Carolina							1	1				
Georgia								3	2		1	
East South Central:												
Tennessee								1	1			
Kentucky							1	2	1			
West South Central:												
Arkansas						1						
Louisiana							3					
Texas							2					
Mountain:												
Wyoming							2					
Pacific:												
Washington	1				3	2	5	3				
Oregon		1	1	2				1				
California	4			5	3	5	10	8	4	3	5	

[1] Secondary cases and asymptomatic carriers excluded.

Table 2. Age distribution of 248 patients with salmonellosis due to Salmonella reading

Age group	Number	Percent
All ages	248	100
6 years and under	171	69
Less than 6 months	28	11
6–11 months	18	7
1 year	19	8
2 years	38	15
3 years	30	12
4 years	18	7
5 years	10	4
6 years	10	4
Over 6 years	77	31
7	4	2
8	6	2
9	3	2
10	6	2
11–14	11	4
15–19	4	2
20–29	7	3
30–39	15	6
40–49	5	2
50 and over	16	6

what longer in the group less than 1 year of age.

Leukocyte counts were available for only 20 patients and are summarized also in table 4. The counts ranged from 3,150 to 20,000 per cubic millimeter with the median values tending to decrease with increasing age. A slight to moderate lymphocytosis is reflected in the differential counts, with the expected higher lymphocyte counts in the younger age group.

All study group patients were, of course, positive for *S. reading* by stool culture. Blood cultures were made for only 8 patients. Of these, 7 cultures yielded *S. reading*. No diarrhea was reported for 4 of these 7 patients.

Elevated temperatures were reported for 94 percent of the 65 patients for whom this information was given. The median of highest recorded values was 103.2° F. (table 5). Febrile convulsions occurred in only one child, a 2-year-old girl. Diarrhea was considered present only when 5 or more stools occurred in 1 day.

Table 6 summarizes the data regarding secondary episodes of gastroenteritis in 65 exposed families. Attack rates calculated by family size revealed similar rates in all families.

Local health department personnel obtained stool cultures from family contacts in 33 households harboring index cases. *S. reading* was isolated from specimens obtained in 55 percent of these households (table 7). Mothers were positive four times more frequently than were fathers. As noted in table 6, only 5, or 23 percent, of the 22 *S. reading* positive children reported any gastrointestinal illness. However, *S. reading* was found in cultures from one-third of the children ill with gastroenteritis who were family contacts.

Among the index cases, other *Salmonella* types in addition to *S. reading* were isolated from 9 patients. These types included *S. muenchen* isolated from 3 patients, *S. paratyphi* B, from 2 patients, and *S. manhattan*, *S.*

Table 3. Hospitalization of 69 patients with salmonellosis due to Salmonella reading

Age group [1]	Total		Hospitalized			
	Number	Percent	Number	Percent	Duration (days)	
					Median	Range
All ages	69	100	35	51	8	2–26
Children:						
0–5 months	8	19	7	54	8	4–26
6–11 months	5					
1–4 years	30	44	14	47	6	2–13
5–9 years	12	17	6	50	9	3–18
10–17 years	10	15	5	50	6	3–20
Adults:						
32–64 years	4	6	3	75	10	6–14

[1] Median age 3 years (range 1 week–64 years).

Table 4. Severity and duration of illness and leukocyte counts of 69 patients with salmonellosis due to Salmonella reading

Age group	Severity and duration of illness						Leukocyte counts				
	Total patients	Severity			Duration (days)		Number patients	1,000 cells per cubic millimeter		Differential (median percent)	
		Mild	Moderate	Severe	Median	Range		Median	Range	Polymorphonuclears	Lymphocytes
All ages	[1] 64	13	17	34	7	------	20	------	------	------	------
Children:											
0–11 months	13	2	3	8	14	5–60	2	13	9. 7 –17	20	78
1– 4 years	29	6	8	15	7	2–70	12	11. 5	3. 15–20	33	64
5– 9 years	9	2	3	4	8	3–60	6	10. 35	5. 8 –11. 8	51	43
10–17 years	9	3	3	3	6	2–30	------	------	------	------	------
Adults:											
32–64 years	4	------	------	4	17	4–25	------	------	------	------	------

[1] Severity and duration of illness unknown for 5 patients.

typhimurium, *S. montevideo*, and *S. siegburg* from 1 patient each. Cultures of family contacts revealed 6 individuals with other *Salmonella* types: *S. typhimurium*, *S. bareilly*, *S. sandiego*, *S. muenchen*, and *S. oranienburg* were each isolated from one patient, and another patient was found positive for both *S. muenchen* and *S. oranienburg*. Admittedly, the usual press of laboratory work does not permit the serotyping of any large number of colonies from a single specimen. Consequently, the above is only a suggestion of what other *Salmonella* types may have been present in these patients and contacts.

Food History

A summary of the responses to questions on food consumption is given in table 8. No comparable data were collected from an unaffected control population. Some difficulty was anticipated in obtaining accurate food histories since the average time lapse between the date

Table 5. Clinical characteristics of 69 patients with salmonellosis due to Salmonella reading

Age group	Total	With fever	Without fever	Median temperature (F.) [1]	Symptoms							
					Diarrhea [2]		Blood and mucus in stool		Vomiting		Abdominal cramps	
					Number	Percent [3]	Number	Percent [4]	Number	Percent [3]	Number	Percent [3]
Total	[5] 69	61	4	103. 2	58	84	31	53	30	43	39	70
Children:												
0–11 months	13	11	2	102. 4	13	100	9	69	3	23	------	------
1–4 years	[5] 30	24	2	103. 3	24	80	18	75	14	47	19	63
5–9 years	12	12	0	103. 2	10	83	3	30	6	50	9	75
10–17 years	10	10	0	103. 8	8	80	1	13	5	50	7	70
Adults:												
32–42 years	4	4	0	102. 4	3	75	0	0	2	50	4	100

[1] Highest values recorded.
[2] 5 or more stools per day.
[3] Based on total of 69 patients.
[4] Based on 58 patients with diarrhea.
[5] Temperature unknown for 4 patients.

of onset of gastroenteritis and that of the interview was 8 weeks. Recall of specific foods eaten prior to onset of the illness, therefore, appeared to be an unrealistic expectation. Consequently, an enumeration of the family's usual food intake was requested. Families were looked upon as a unit in terms of foods consumed since transfer of *Salmonella* among family members may have easily occurred in many instances.

Special emphasis was placed on a search for some single consistently mentioned brand name of a nationally distributed food or food product. None was found frequently enough to implicate it as the presumed common vehicle.

Table 6. Secondary episodes of gastrointestinal disease in 65 families

	Total	Families or persons ill	
		Number	Percent
Exposed:			
Families	65	27	42
Family members	252	[1] 45	18
Positive for *Salmonella reading:*			
Children	22	5	23
Adults	15	2	13

[1] Median age 16 years.

Table 7. Results of stool cultures of family contacts of patients with salmonellosis due to Salmonella reading

Group cultured	Cultures		
	Total	Positive for *S. reading*	
		Number	Percent
Families	33	[1] 18	55
Children	64	[2] 22	34
Mothers	33	12	36
Fathers	33	3	9
Patients ill with gastroenteritis:			
Children	15	5	33
Adults	11	2	18

[1] 2 or more family members positive for *S. reading* in 8 families, or 24 percent of total families.
[2] Median age, 5 years.

Table 8. Frequency of consumption of foods [1] in families of patients with Salmonella reading infection

Food item	Total families questioned	History of food consumption	
		Number	Percent
Mayonnaise or salad dressing	60	60	100
Chicken	68	67	99
Peanut butter	40	39	98
Ice cream	69	67	97
Cheese [2]	69	62	90
Cottage cheese	69	46	67
Gelatin dessert	69	61	88
Oleomargarine	60	50	83
Uncooked dried fruit	60	38	63
Toothpaste A	69	36	52
Toothpaste B	69	19	28
Frozen meat pies	68	33	49
Infant formula or foods	60	21	35
Precooked frozen dinners	58	6	10

[1] Multiple brand names mentioned for all items.
[2] Other than cottage cheese.

Many different brand names were mentioned for the most frequently reported foods listed in table 8. Foods previously implicated in extensive outbreaks of salmonellosis, such as canned meats (*2*) or dried eggs (*3, 4*), were not commonly used in these families. Frozen meat items requiring only warming before use were also infrequently encountered. The possibility remains, of course, that the crucial food item may not have been included among those on the food questionnaire.

Families were also questioned about the presence of pets in the home. Only 8 families of the 69 questioned owned either a cat, a dog, or a parakeet.

In view of these negative findings, an alternative hypothesis was employed which suggested that some common additive to a frequently mentioned food might be the sought-after common vehicle of infection. This possibility was investigated by means of a study of ice cream which had been mentioned by 97 percent of the families interviewed. A careful enumeration of the ingredients used in several of the ice cream brands consumed failed to reveal any single nationally distributed common additive. Other commonly used foods, such as mayonnaise or salad dressing and peanut butter

(table 8), were disqualified as potential *Salmonella* vehicles because of the failure of these organisms to survive in such media (*5*, *6*). Chicken was consumed by 99 percent of families questioned. However, it was not apparent how birds from many different sources, including small home-fed flocks, could all be infected with a similar, previously rare *Salmonella* type.

In view of the large number of children affected, special attention was given to foods which might be common to this age group. Despite several specific questions included in the food questionnaire, no common brand name baby food, vitamin preparation, or formula mixture was encountered.

Discussion

As an estimate of the magnitude of the problem, data on the number of isolations of *S. reading* in previous years were provided by Dr. Philip R. Edwards, who reported that, during the 8-year period from 1948 through January 1956, only 24 cultures of *S. reading* were identified among approximately 18,000 cultures received. In contrast, 125 isolates representing individual cases were identified at the Communicable Disease Center as *S. reading* during the 16-month period from May 1956 through early September 1957. Of particular interest was the apparent concentration of cases in this country, with few cases reported elsewhere. Inquiries to *Salmonella* typing centers in Canada, England, Northern France, West Germany, and the Netherlands failed to reveal any recent marked increase of *S. reading* isolations in these areas corresponding in time with the peak of cases in this country. However, in 1952 the Netherlands had experienced a sharp rise in *S. reading* cases from an average of 2 to 4 per year to 51 isolations that year. No explanation of this sudden increase and equally sharp decline was available.

Isolations From Animals

As a further attempt at solution of the problem, additional instances of recent *S. reading* isolations, other than from humans, were looked for. State veterinary public health officers were contacted by Dr. James H. Steele, chief, Veterinary Public Health Section, Communicable Disease Center, and 9 recent poultry outbreaks of clinically evident salmonellosis due to *S. reading* were reported. The chart shows the few July and August 1956 poultry isolations which preceded the sharp rise in human cases. Since the virulence of *Salmonella* types varies considerably in chicks (*7*), the organism may be carried with minimum symptoms, and *S. reading* might have been extensively distributed among poultry despite the few reported isolations. Galton and associates (*8*) have demonstrated the frequency with which salmonellae may be detected in poultry processing plants. If fowl were contaminated with salmonellae, then some nationwide means of infecting poultry would have to be postulated. Feeds might serve this function particularly since a constitutent of many poultry feeds is frequently contaminated with *Salmonella*.

Fishmeal imported into West Germany, where much of it is used in animal feeds, was frequently found to be contaminated with *Salmonella* according to Rohde and Bischoff (*9*) and Adam (*10*). Furthermore, the isolation of the new serotype *Salmonella blockley* from fishmeal in 1955 occurred almost simultaneously with the occurrence of the first human cases of *S. blockley* infection (*11*, *12*). A relationship between the two through the medium of infected animals was inferred. During 1957, according to a personal communication from Dr. H. P. R. Seeliger, *S. reading* was isolated in West Germany from imported fishmeal and was also found to be the etiological

Data on the incidence of *Salmonella reading* isolations in their respective countries were provided by: Dr. E. T. Bynoe, Laboratory of Hygiene, Department of National Health and Welfare, Ottawa, Canada; Dr. Joan Taylor, Salmonella Reference Laboratory, Central Public Health Laboratory, Colindale, London, England; Dr. R. Buttiaux, Institut Pasteur de Lille, Centre d'Enseignement et Recherches de Bactériologie Alimentaire, Lille, France; Dr. H. P. R. Seeliger, Salmonella-Zentrale, Hygiene-Institut der Universität Bonn, Bonn, Germany; Dr. A. Clarenburg, Rijks Instituut Voor de Volksgezonheit, Utrecht, Netherlands.

agent in several outbreaks of food poisoning. Other investigators have had varying degrees of success in isolating salmonellae from fishmeal. Walker (*13*) found no positives among 10 samples cultured while Cook, Hobbs, and McCoy recovered salmonellae from 14 of 54 samples studied. Their unpublished report is cited by Walker (*13*). Rohde and Bischoff (*9*) found salmonellae in 43 of 270 samples, while Adam (*10*) reported 16 percent of 833 fishmeal specimens positive for the organism.

In the United States fishmeal is used extensively in a variety of poultry feeds. Of 16 specimens of domestic fishmeal examined bacteriologically by one of the authors (Boring), salmonellae were found in 9 instances. *S. reading* was not among the types isolated, but these specimens were collected during July and August of 1957, well after the peak of the "outbreak." If poultry flocks may in fact become infected with *Salmonella* from contaminated feeds, a potentially major public health problem exists. Thal and co-workers (*14*) and Seeliger (*12*) have discussed the probability of infection of domestic animals with *Salmonella* from such contaminated feeds. The danger of human infections from contaminated flocks has been discussed by Abelseth and Robertson (*15*), Edwards (*16*), and others.

Clinical and Laboratory Material

Among the 300 or 400 reported acute cases of salmonellosis due to *S. reading*, two deaths occurred in children. A 10-year-old Negro boy died 5 days after onset of symptoms, following a rapidly downhill course. Stool and blood cultures were positive for *S. reading*. The final diagnosis included congenital heart disease, acute and subacute bacterial endocarditis with *Salmonella* sepsis, and sickle cell anemia. His hemoglobin level was reported as 6.2 gm./100 ml. An infant death was reported with no other information available. The only localized *Salmonella* infection reported occurred in a 2-year-old white boy who developed septic arthritis of the calcaneotibial joint. No attempt is made to calculate a case fatality rate in this epidemic for want of a reasonably accurate denominator.

Salmonellosis due to *S. reading* appears to present clinical features similar to those described for previous series of patients with *Salmonella* infections (*17*, *18*). However, complications were not present in the study group, although they were reported among patients for whom only incomplete histories were available. The rarity of complications reflects the relatively low virulence and noninvasiveness of *S. reading*. Furthermore, previous reviews referred to dealt only with hospitalized patients, while in the present series half of the patients were not hospitalized. As noted previously, a majority of these patients came from families with above average incomes so that nutrition, sanitation, and medical care approached the optimal level. Eisenberg and associates (*18*), reporting on a series of 95 patients with salmonellosis seen at the Philadelphia General Hospital noted localized infections in 13 percent of their patients. Many patients in that series were from a lower socioeconomic group, which further sets them apart from the present series of patients. Among 100 infants and children with salmonellosis reported by Clyde (*19*) from Nashville, Tenn., localization occurred in 9 percent. By comparison with these reports, the 69 patients with *S. reading* infection reported had a relatively mild illness. Nevertheless, 53 percent of the patients voiced the subjective impression that their illness was severe.

Several factors serve to indicate that the "epidemic" of *S. reading* infections was a family affair with a common source of infection in the family. Of the 252 family members exposed in the homes of index cases, 30 percent were either positive for *S. reading* by stool culture or had suffered from gastroenteritis. Even more striking was the finding that in 42 percent of families, at least one secondary illness had occurred. Also, in 55 percent of the 33 families cultured (table 7), at least one contact was found to be positive for *S. reading*. In 55 percent of the 65 exposed families, at least one person was bacteriologically positive or had developed gastroenteritis.

As shown in table 7, mothers were more frequently positive for *S. reading* than were fathers. The significance of this finding is not entirely clear. The mother might be infected or reinfected from her children, who are physically closer to her than they might be to

the father. However, the mother would also be the first member of a family to come in contact with an infected foodstuff. If she prepared this item for cooking, perhaps as with poultry, she might infect herself and other family members by handling salad, the bread plate, the baby's formula, or a host of other items. Necessarily, this is only conjecture.

Two infants aged 2 weeks and one infant 1 week old developed diarrhea, which was later proved to be due to *S. reading* The mother of one infant had been ill with gastroenteritis prior to delivery, while the mothers of the two other infants were positive for *S. reading* sometime later. As has been demonstrated previously (*20*, *21*), these mothers may have infected their newborn infants during parturition. Since asymptomatic carriers of *S. reading* appeared to be common among family contacts (table 6), inadvertent infection of the more susceptible infants and young children may have occurred frequently.

Among the younger patients in this series, a problem was apparent because of the unusually long duration of the convalescent carrier state. Where a series of cultures negative for *Salmonella* was required before hospital discharge, hospitalization was often unduly prolonged. The difficulty and expense of keeping an asymptomatic child hospitalized usually resulted in discharge due to desperation before the required number of negative cultures were obtained. Realistically, greater emphasis should be placed on the child's clinical course in determining the need for hospitalization than on the duration of stool cultures positive for *Salmonella*. Rubinstein and associates (*22*) have noted the long duration of carrier states with various *Salmonella* types. In a followup study of an outbreak of *S. oranienburg* in a nursery for the newborn Rindge has also noted the long duration of the carrier state in infants (personal communication). Among infants in families without other *S. oranienburg* positive members, the mean duration of the carrier state was about 7 months. Szanton (*23*) reporting the 40-month followups on this same series of 33 infected infants found, for the total group, that the carrier state persisted for an average of about 14 months. The futility of applying standard "three negative stool" requirements to young children hospitalized with salmonellosis is emphasized by these findings. Perhaps parents of these children might be instructed in the necessary home precautions so that, when the clinical condition permits, a child could be discharged from the hospital. Subsequent stool specimens could then be obtained at home.

Summary

More than 300 acute sporadic cases of salmonellosis due to *Salmonella reading*, a previously extremely rare serotype, were reported during a 12-month period. Intensive study of food histories from patients in various parts of the country failed to reveal the presumed common source responsible for this "outbreak." A possible but unknown relationship between infected animal feeds and poultry to the present *S. reading* problem is discussed.

Detailed clinical and laboratory data are presented for 69 salmonellosis patients. The absence of complications in this group is noted and discussed. Among 252 exposed family members, 30 percent had either been ill or were found positive for *S. reading* by stool culture. In 55 percent of 65 families studied at least one member had gastroenteritis or was positive for *S. reading*.

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Bertha Adkins Named Under Secretary

Bertha Sheppard Adkins was named Under Secretary of Health, Education, and Welfare on July 21, 1958, succeeding John Alanson Perkins who resigned. She had been assistant chairman and head of the women's division of the Republican National Committee since 1953.

From 1934 to 1942 Miss Adkins held the post of dean of women at Western Maryland College and during the following 4 years served as dean of residence at Bradford Junior College in Massachusetts. On graduation from Wellesley College in 1928, Miss Adkins taught in private schools until 1932. She holds a master of arts degree from Columbia University conferred in 1943 and is a life member of Pi Lambda Theta, an honorary society for women in education.

Control of Radioactive Liquid Wastes in Pennsylvania

KARL M. MASON, M.P.H.

On September 12, 1957, the Sanitary Water Board of the Pennsylvania Department of Health authorized issuance of a permit to the Duquesne Light Company for the treatment and discharge of liquid wastes from the company's steam turbine power plant employing heat exchanged from a nuclear reactor, at Shippingport. Located on the Ohio River some 25 miles from Pittsburgh, this power reactor is the first such installation in this country with disposition of its waste materials regulated by a State health agency.

When, in early 1954, it became certain that the first commercial power reactor was to be constructed in Pennsylvania, the State department of health and its water pollution control agency, the Sanitary Water Board, looked to their responsibilities. Despite the indecision at the time concerning the jurisdictions of the Atomic Energy Commission and State agencies, the State health department elected to apply its authority under its general health powers to the adoption of radiation protection regulations. In addition, the Sanitary Water Board classified radioactive liquid wastes as industrial wastes, thus requiring a permit for discharge of any such wastes to the waters of the Commonwealth.

With the assistance of the Radiological Health Branch of the Public Health Service, the technical staff of the bureau of environmental health developed the conditions under which these liquid wastes could be discharged. As a result of the cooperation and competence of officials of the Duquesne Light Company and Westinghouse Electric Corporation, early agreement was reached on the radioactivity limits deemed necessary for the protection of the public health. The company, in its application report, had adhered to the maximum permissible concentrations recommended in Handbooks 52 and 61 of the Bureau of Stand-

Mr. Mason is the director of the bureau of environmental health, Pennsylvania Department of Health.

ards and the requirements of the health department's Radiation Protection Regulation. However, as indicated by the permit accompanying this article (p. 898), in the interest of public health protection, more stringent requirements were incorporated into this document than are recommended by national authorities.

The Reactor and Its Wastes

The Shippingport atomic power station is designed to produce electric energy by a conventional turbine-generator unit. The first reactor core has a rating of 231 megawatts heat, producing a 60-megawatt net electrical output. Subsequent cores will have ratings up to 340 megawatts heat and 100 megawatts gross electrical output. Steam for the turbine is supplied by the primary plant, consisting of the nuclear reactor and its associated systems. This plant is comparable to the furnace and boiler of a conventional power station.

The pressurized water reactor consists of a closed system in which water at high pressure is circulated over an array of nuclear fuel elements (the core) to heat exchangers where steam is formed in a separate, isolated system. The active portion of the nuclear core is a cylinder about 6 feet in diameter and 6 feet high containing highly enriched uranium assemblies (called seed) and natural uranium assemblies (called blanket). The seed assemblies contain a total of 75 kilograms of enriched uranium–235, and the blanket contains 14 tons of natural uranium metal in the form of UO_2.

The radioactive wastes are classified into eight categories: reactor plant effluents, service building wastes, fuel canal water wastes, spent ion-exchange resin and incinerator ash wastes, combustible solid wastes, noncombustible solid wastes, gaseous wastes, and boiler water. The three main sources of radioactivity which contribute to the liquid wastes are:

1. The activation of corrodible metals, corrosion products, and trace elements in the high-purity reactor coolant water.
2. Fission products released from failed fuel elements.
3. Tritium resulting from activation of the lithium hydroxide added to the reactor coolant water to minimize corrosion in the system.

It is estimated by the company in its report that only about 2.5 percent of the total radioactivity will be discharged to the river. Most of the remainder will be retained in the spent ion-exchange resin storage tanks (97.4 percent); a minute percentage will be discharged as gas to the atmosphere (0.01 percent).

In order to insure that the required degree of treatment is provided, the liquid wastes are sampled and the level of radioactivity determined at each stage of the treatment process. During a long period of retention in underground storage tanks the radioactivity is reduced appreciably by decay, and subsequent processing through the ion-exchangers reduces further the radioactivity of these wastes. Thus, the entire treatment is a series of batch processes prior to discharge to the river, and the wastes may be reprocessed if the samples indicate that the required reduction in radioactivity has not been accomplished. The high-level radioactive wastes which are retained in the ion-exchanger are held for disposition by burial elsewhere at locations supervised by the Atomic Energy Commission.

Safety Factors

The accepted standard applied to the discharge of liquid wastes to streams utilized for public water supplies is that the radioactivity for unknown mixed fission products shall not exceed an annual average of 1×10^{-8} microcuries per milliliter above natural background radioactivity at the next point of use downstream. To provide extra protection for the waters traversing Pennsylvania and to retain a portion of the stream flows for the discharges from future nuclear facilities, several safety factors were added to this standard.

As an example, the sampling point for Shippingport wastes is in the plant's effluent channel containing the condenser cooling water. This location results in an extra safety factor of more than 100 since the maximum amount of condenser cooling water is less than 1/100 of the mean flow of the Ohio River. Another appreciable factor of safety is that the limits of radioactivity apply at any time, rather than to the average concentration over an interval

of 1 year. These same conservative requirements have been incorporated in the permits issued to six other nuclear facilities of various types and will be applied to several applications now under consideration.

In considering the application of the Duquesne Light Company, one of the initial counterproposals of the Pennsylvania Department of Health was that the company reduce substantially its request for an emergency discharge of 700 curies of tritium in 1 day should an accident occur in any of the coolant loops. Although this amount of tritium was below the maximum permitted by accepted standards for an average concentration over an entire year, the company agreed to withdraw this proposal and limit the maximum discharge of tritium during any 1 day to less than 1 percent of the maximum allowable concentration. This agreement is consistent with the objective of the department of health and its Sanitary Water Board to produce and discharge the least amount of radioactivity practicable. Recent analyses of waste discharges from the Shippingport plant indicate that it will be possible to conform to the stringent standards for fission products as well as for tritium.

During 1956 and 1957 the Westinghouse Electric Corporation conducted, under the sponsorship of the Atomic Energy Commission, a site-monitoring program in the vicinity of the Shippingport plant. The purposes of the preoperational phase of this program were to determine the types and amounts of radioactive materials which occur in the environment around the reactor plant and to determine the variations in the amounts of these materials over a period of approximately 1½ years prior to operation. Analyses were made on (*a*) soil in the general vicinity of the plant, (*b*) Ohio River water above and below the site, (*c*) well water within a 1-mile radius, (*d*) vegetation in this general area, and (*e*) the air in the general area.

Although the department of health accepted the reports of Westinghouse's study and assisted in some of the sampling, it decided to initiate further studies in the area in order to encompass all phases of the environment subject to possible contamination by radioactivity. Through the efforts of the department's public health veterinarian, specimens of animal life and milk products have been collected and analyzed for radiation levels, both in the general area of the plant and in a control area. Using Federal program grant funds, the department has contracted with the University of Pittsburgh to determine the radioactivity levels of all types of aquatic life in the Ohio River above and below the plant site. Since both the department of health and the Duquesne Light Company are continuing the site-monitoring programs on a postoperational basis, data will be available on all of the environmental aspects which could be affected by nuclear facilities in this area.

Summary

Public health authorities in Pennsylvania are administering a program of radioactive liquid waste control in the following manner:

1. Radioactive liquid wastes have been classified as industrial wastes and thus are subject to a permit from the Sanitary Water Board.

2. Since the treatment processes employed at such installations have not been subject to full-scale operation experience, the permits are granted on an experimental basis.

3. For the purpose of insuring protection of the public health and the retention of stream volumes for future discharges, the levels of radioactivity in liquid wastes must conform to more stringent standards than those generally accepted.

4. The conditions of the permit, including the maximum allowable concentrations, are subject to revision if altered conditions or the advance of science and technology so indicate.

5. The discharge of radioactivity shall be kept at the most practicable minimum, regardless of maximum amounts permissible.

6. Adequate analyses and operational reports must be submitted to the department of health.

7. Environmental monitoring programs shall be continued and, if necessary, expanded.

8. Immediate notification of the department is required in the event of accident or discharge in excess of tolerance.

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF HEALTH

SANITARY WATER BOARD

HARRISBURG

INDUSTRIAL WASTES PERMIT NO. 1832

The Sanitary Water Board, which by virtue of the Act of April 9, 1929, P. L. 177, known as The Administrative Code of 1929, and the amendments thereto, and of the Act of June 22, 1937, P. L. 1987, as amended by the Act of May 8, 1945, P. L. 435, is empowered to exercise certain powers and perform certain duties "To preserve and improve the purity of the waters of the Commonwealth for the protection of public health, animal and aquatic life, and for industrial consumption, and recreation; . . .", hereby issues this permit to the Duquesne Light Company, 435 Sixth Avenue, Pittsburgh 19, Pennsylvania, its successors or assigns, approving, subject to certain conditions, the proposed works for the treatment of wastes from the permittee's atomic (nuclear reactor-steam turbine) power plant located in Shippingport, Beaver County, Pennsylvania, with discharge of the treated effluent therefrom into a channel of the Ohio River between its left, or southern, bank and Phillis Island, about 11 miles below the confluence of the Beaver River, in response to an application, undated but attested June 19, 1957.

This plant is designed for the production of 60 megawatts, i. e., 60,000 kilowatts of electrical energy during initial operation. Later, possibly after about a year, and when the present core has been replaced by a more powerful one, the plant is expected to reach a maximum rating up to 340 megawatts of heat and 100 megawatts gross electrical output.

This application requests approval of "the discharge to the Ohio River of an average of 12,000 gallons per day of waste water containing approximately 10 curies of tritium and 1,590 microcuries of other radioactive materials. This effluent consists, for the most part, of laundry and shower room wastes and neutralized laboratory wastes which are released to the condenser effluent stream at a controlled rate. The lesser portion of the discharge consists of reactor plant wastes. The system consists of gravity collection tanks; intermediate storage and decay tanks; processing by evaporator, ion-exchangers, gas stripper; followed by controlled discharge to the river. Radioactivity is measured at each stage of the process and before discharge." It is to be noted that the term "neutralization," as used above, refers only to chemical neutralization.

The proposed plant and waste treatment works will provide for batch treatment of all wastes. If in the opinion of the Sanitary Water Board, any wastes are inadequately treated, facilities will be available for recycling such wastes through all or parts of the treatment process until the effluent is satisfactory for discharge to the waters of the Commonwealth when diluted with the normal volume of cooling water. The proposed works are described in some detail in an engineering report entitled "Duquesne Light Company—Shippingport Atomic Power Station—Shippingport Borough—Beaver County, Penna.—April 20, 1957" and are shown on twelve sketches and diagrams bound with the report and entitled and described as follows:

Artist's Conception of the Shippingport Atomic Power Station.

Figure 1. Duquesne Light Company—Territory Served and Location of Principal Facilities—December 31, 1955—No. SP-507.

Figure 2. Shippingport Power Station—Duquesne Light Company—Plan Showing General Arrangement.

Figure 3. (This is an isometric drawing, diagrammatic, showing the reactor and four main coolant loops.)

Figure 4. PWR Reactor Vessel.

Figure 5. (These are enlarged detail sketches of reactor core, seed and blanket assembly, fuel rods, etc.)

Figure 6. Seed Assembly Cross Section.

Figure 7. PWR Fuel Rod Exploded View.

Figure 8. Reactor and Steam Plant—Plan View.

Figure 9. Radioactive Waste Disposal System—Plot Plan.

Figure 10. Radioactive Waste Disposal System (flow sheet).

Figure 11. Shippingport Power Station—Area Survey Stations. . . .

Also bound with the company's report are two tables, "Table I—Expected Maximum Steady-State

Activity For Non-Volatile Fission Products in the PWR Wastes—Duquesne Light Company—Shippingport Atomic Power Station" and "Table II—Activity Discharged to River—Waste Disposal System—Duquesne Light Company—Shippingport Atomic Power Station."

The report and plans were prepared by J. A. Tash, Eng., Power Stations Dept. of the Duquesne Light Company. The report is signed by W. J. Lyman, a professional engineer, Pennsylvania Registry No. 5582, Vice-President, Operations Division, Duquesne Light Company, and stamped as received in the Pennsylvania Department of Health, Division of Sanitary Engineering, Region III, on June 21, 1957.

These plans are hereby approved subject, nevertheless, to the condition that the waste treatment plant to be constructed under said plans will produce an effluent satisfactory to the Sanitary Water Board. By this approval, neither the Board nor the Commonwealth of Pennsylvania assumes any responsibility for the feasibility of the plans or the efficiency of the operation of the plant to be constructed thereunder.

This permit is issued subject to the following Special Conditions:

A. The waste treatment facilities shall be constructed and ready for operation coincident with the start of power operation of the reactor.

B. Approval of plans refers to waste treatment and not structural stability, which is assumed to be sound and in accordance with good structural design. Failure, because of faulty structural design or poor construction, of the works herein approved will render this permit void.

C. Since the herein approved works employ principles not at present considered conventional, they must be regarded as *experimental* and the subsequent action of the Sanitary Water Board will depend on actual performance in eliminating the objectionable characteristics of the waste waters as discharged from the works in question.

D. The discharge of untreated or improperly treated industrial wastes to the waters of the Commonwealth is contrary to the requirements of the Sanitary Water Board. If, because of accidental breakdown of the treatment works or plant equipment or for any other reason, any such discharge should occur, then the operation of any process producing such discharge shall be discontinued until repairs to the treatment works or other satisfactory measures to prevent stream pollution shall have been completed.

E. The permittee is hereby directed to immediately notify the Pennsylvania Department of Health whenever there is a spill or an accidental discharge of radioactive material and shall advise that Department promptly concerning the pertinent facts and probable danger. The permittee shall maintain rosters of Pennsylvania Department of Health personnel and of downstream users of river water who shall be notified. The necessary information for such rosters shall be furnished to the permittee by the Department of Health. In the event of any such accidental discharge, the Department of Health shall determine whether or not downstream users shall be notified, and by whom.

Moreover, the permittee is required to see to the training and supervision of all operating personnel, in order to prevent the discharge of such material, fluid or solid, to the waters of the Commonwealth or to the site, without adequate treatment.

F. All industrial wastes discharged to the portion of the Ohio River on which the permittee's plant is located shall meet at least the requirements of the Sanitary Water Board for primary treatment. "Primary treatment" does not apply to the radioactive characteristics of the wastes.

The term "primary treatment," as here used, is such treatment of sewage as, in the opinion of the Board, will remove practically all of the settleable solids; will remove at least 35 percent of the organic pollution load as measured by the biochemical oxygen demand test; will accomplish the removal of oils, greases, acids, alkalis, toxic, putrescible, taste- and odor-producing substances, and other substances inimical to the public interest in the receiving stream; will provide effective disinfection to control disease-producing germs; will provide for satisfactory disposal of sludge; and will produce a final effluent that is suitable for discharge into the receiving stream. "Primary treatment of industrial wastes," as here used, is treatment to a degree equivalent to that set forth herein for sewage.

Moreover, because of the radioisotopes which these wastes may carry, such wastes shall be substantially free of turbidity and suspended solids over and above the amounts of such characteristics in the intake water.

G. The treated radioactive liquid wastes as discharged to the Ohio River shall comply with the Pennsylvania Department of Health Radiation Protection Regulation 433 and any subsequent regulations of the Department of Health.

H. With respect to the amount of radioactivity released in the liquid wastes to the waters of the Commonwealth, this permit is issued subject to the following conditions: (1) that the average radioactivity, exclusive of tritium activity, of these wastes over any consecutive 365-day period shall not exceed 1,590 microcuries per day, with the maximum discharge not exceeding 6,200 microcuries per day, (2) these wastes shall at no time carry more radioactivity, exclusive of tritium activity, than 10^{-8} microcuries per milliliter in excess of that of the plant intake water from the Ohio River, and (3) that the discharge of tritium in these wastes shall be not more than 10 curies per day averaged over any consecutive 365-day period, nor more than 50 curies per day maximum. Moreover, the company shall conduct all its pressurized water reactor operations so as to produce and discharge the least practicable amounts of radioactivity.

I. Although tritium has a short biological half-life (19 days) and a maximum permissible concentration (MPC) of 0.2 microcuries per ml. (according to Handbook 52 of the National Bureau of Standards) as compared with an MPC of 10^{-8} micro-

curies per milliliter for the general population for unidentified isotopes, its radiological half-life is long enough (4,600 days) to make its continued presence in the stream undesirable and possibly inimical to aquatic and other life. At the present time, it is reported, there are no practical means for its separation from a liquid. The permittee, however, shall continue to investigate and apply more effective means to remove this potential hazard as rapidly as such means are developed, or attempt to devise some other means or to attempt to find some other substance which will have advantages similar to that of lithium hydroxide without producing the present discharge of tritium. The attention of the permittee is directed to the possibility that tritium may prove objectionable as a constituent of water used for certain industrial processes.

J. The radioactive and other liquid wastes discharged to the effluent channel shall be well admixed with the cooling water so that the waste content of this channel shall be substantially uniform below the effluent weir or at the sampling rake.

K. The treated effluent shall be discharged to the river in a manner acceptable to the Sanitary Water Board. If any structure is necessary to accomplish this, it shall be well protected against the effects of flood waters, ice, and other hazards and the design of such structure shall be acceptable to the Sanitary Water Board.

L. Provision shall be made for regulating the discharge of the treated effluent so that it shall be equally distributed over the longest practicable period, in order that advantage may be taken of maximum possible dilution by the receiving stream, and means to accomplish uniform 24-hour distribution shall be provided if in the opinion of the Department of Health this shall be found necessary.

M. The wastes after treatment and prior to discharge to the effluent channel shall contain no more than 0.05 p.p.m. of hexavalent chromium and 1.0 p.p.m. of trivalent chromium.

N. The permittee shall provide means for measuring the total volume as well as variations in the rate of discharge of all waste water. Equipment to automatically record this information shall be provided promptly if directed by the Department of Health.

O. Any solid waste material including radioactive material shall be so handled that a nuisance is not created, and shall be disposed of in a safe and sanitary manner to the satisfaction of the Department of Health and in accordance with the provisions of the Pennsylvania Department of Health Radiation Protection Regulation 433 and any subsequent regulations of the Pennsylvania Department of Health.

P. It is required that a sampling schedule be maintained and that records thereof be kept together with records of the operation of the waste disposal system, and that such data be submitted in reports to the Department of Health, covering such particular matters and at such intervals as the Department may direct, beginning within two months after the initial operation of the plant. It is noted that the report submitted with the present application indicates that records will include:

1. Accumulation rate and activity for each class of waste by days.
2. Changes in activity of wastes during processing.
3. Volume and activity of waste discharged.
4. Time of day and duration of discharge with volume and activity automatically recorded.

The special nature of the wastes produced at the permittee's Shippingport plant may cause the Sanitary Water Board to require additional sampling, analysis, and testing of the surface and underground waters in the vicinity, particularly of the Ohio River at points above and below the plant, in order to determine the effects of radioactivity on these waters.

The report submitted to the Board by the permittee, in support of its permit application, indicates that such sampling is being conducted at present by or under the sponsorship of the U. S. Atomic Energy Commission. If for any reason, however, the AEC does not continue this sampling, or if in the opinion of the Sanitary Water Board additional data are needed, the permittee may be required to conduct such sampling and analysis as the Board may direct.

Q. Acknowledgment is made of the company's study now in progress to determine temperatures and percentage of river volume that flows through a narrow river channel between Phillis Island and the mainland to determine the expected rise in river water temperature in this channel when the condenser cooling water is discharged to it. The permittee is hereby advised that the river water temperature rise is tentatively limited to 2° F. at points to be determined by the Sanitary Water Board after the results of the thermal studies of the channel and of other data have been reviewed, and that if this limit cannot be maintained with the proposed method of discharge, then complete dispersal of the condenser effluent in the river, or other means for temperature control, may be necessary. The report on the river channel study shall be submitted in duplicate to the Sanitary Water Board within 60 days of completion of the study which is expected to terminate in the last months of 1958, with progress reports on a quarterly basis.

R. The permittee shall submit to the Sanitary Water Board a comprehensive report on the operation of the herein approved treatment works within six weeks after completion of the first half-year of operation, and within a similar period of time subsequent to any substantial change in the operating capacity of the plant or any other marked change in operation or waste treatment. The report shall include pertinent information as to waste volumes, radioactivity before and after waste treatment, the general adequacy of these works in treating all waste discharges from this establishment so as to meet the requirements of the Sanitary Water Board for primary treatment, an overall estimate of the success achieved in (1) the

reduction of the pollution carried to the stream and (2) in the continuous maintenance of a final liquid effluent meeting the requirements of the Board as to uniform admixture with the cooling water.

S. If the effluent as produced by the waste treatment works herein approved shall in the opinion of the Sanitary Water Board prove to be of quality unsatisfactory for discharge into the receiving stream, by reason of the creation of a public nuisance, or because of change in the character or volume of the wastes, or in the use or condition of the receiving stream, or for other reason; or because in the Board's opinion such discharge is or may become inimical or injurious to the public health or to animal or aquatic life or to the use of the receiving body of water for domestic or industrial consumption or for recreation, then a higher degree of treatment (by means of additional plant units or otherwise) shall be provided. Plans for additional works shall be prepared promptly after notice from the Board so to do, and after approval of the plans by the Board, the additional treatment shall be provided and placed in operation within such time as the Board shall require. No construction shall be undertaken without such approval.

T. This permit will be subject to review from time to time by the Sanitary Water Board, and to change if so indicated by altered conditions or the advance of science and technology.

And this permit is further subject to the following numbered Standard Conditions of "Standard Conditions Relating to Industrial Wastes" effective January 1, 1941, attached hereto: 1, 2, 3, 6, 7, 13, 16, and 17.

[NOTE: These standard conditions require adherence to prior permits or orders, compliance with the approved construction plans and with the established effluent standards, adequate supervision during construction, notification of the department of health when construction is completed, proper maintenance of treatment facilities, and permission from Federal authorities for the installation of stream structures.—EDITOR]

This permit is issued in response to an application (No. 12234–IW) filed in the Harrisburg office of the Pennsylvania Department of Health on the 22d day of June A. D. 1957, and in accordance with the authorization given by the Sanitary Water Board at its meeting on September 12, 1957.

SANITARY WATER BOARD
By: BERWYN F. MATTISON, M.D.,
Secretary of Health, Chairman
Attest: JOHN W. GITTINS,
Secretary

HARRISBURG, PENNSYLVANIA,
November 1, 1957

Tuberculosis Casefinding in Schools

The Public Health Service, the Office of Education, and the Children's Bureau have suggested that school and college officials and health departments assess existing tuberculosis casefinding programs among students and employees in the light of the recent official statement of the Public Health Service on X-ray Casefinding Programs in Tuberculosis Control, published in *Public Health Reports*, January 1958.

The Committee on Health of the School Age Child, a joint body of the three agencies of the Department of Health, Education, and Welfare, has made these recommendations:

1. Tuberculosis casefinding programs for children, youth, teachers, and other school personnel should be evaluated and planned in the light of current knowledge concerning the prevalence of tuberculosis and the effects of radiation on the human organism. Professional assistance and advice should be sought from the appropriate State or local health department.

2. Laws and regulations that make periodic chest X-ray examinations compulsory for students, teachers, and other school personnel should be reviewed and modified if necessary to allow health authorities to select the most effective current methods and to utilize applicable new knowledge and techniques of tuberculosis control.

3. Consideration should be given to the use of the tuberculin test as the initial screening device to be followed by a chest X-ray of reactors. The percentage of reactors in some school and teacher populations is low enough to make this a practical procedure.

4. X-ray equipment should be periodically checked and adequate safeguards applied to protect all persons from unnecessary radiation.

Nursing Care for Hemiplegic Patients

Nursing care of hemiplegic patients, the victims of stroke, occupied the 1958 seminar in cardiovascular nursing conducted by the Heart Association of Southeastern Pennsylvania in Philadelphia last February.

The proceedings published by the association consist of papers describing the nature, needs, and management of the condition.

More than a million Americans suffer hemiplegia, said Dr. William J. Erdman II of the University of Pennsylvania School of Medicine. Attacks, resulting from a block of the brain's blood supply, occur at any age. Effects may include a loss of consciousness; flaccid paralysis, usually up to a few days; spasticity in the flaccid area; inability to communicate, although hearing and understanding may be unimpaired; inability to judge what is vertical; loss of the sense of touch; and a painful shoulder.

Dr. Erdman recommended an optimistic attitude, which can be communicated to the patient by explaining the prospect for recovery; accepting the patient's limitations without criticism; drawing favorable attention to each sign of recovery; encouraging patients to do as much for themselves as they are able, without posing tasks so formidable as to discourage them; and encouraging hobbies or employment for the homebound. Although progress is slow, he said, 4 out of 5 patients regain ability to take care of personal needs.

Vera Ford Powell of the Albert Einstein Medical Center's home care program offered specific advice to nurses. The attitudes of the family and the patient must be understood if therapy is to be effective, she said. "The patient is frightened, anxious, and angry. There is never consistency in the cooperation of a patient. The family develops attitudes of pity, hostility, and rejection. Too much help is not good for the patient."

For the nursing of an aphasic (speechless) patient, she advised a relaxed attitude; a calm, friendly, and secure atmosphere; acceptance of the patient's inability to talk; and acceptance of the tendency of the patient to resort occasionally to infantile language or to vile outbursts. She warned nurses not to anticipate what the patient is trying to say, not to say it before the patient has expressed it in full. Recovery, she emphasized, proceeds from tactfully but persistently encouraging the patient to say basic words and perform essential movements in all activities of the day.

Occupational therapists, physical therapists, and others participated in the meeting, which included discussions of self-help devices for the partially paralyzed.

Strike Back at Stroke

GETTING OUT OF BED

A major obstacle in management of stroke patients has been a problem of communication between physician and the patient's family. The above illustration is typical of those used, with appropriate legends, in a new Public Health Service publication, Strike Back at Stroke, to explain how to move and exercise stroke victims. The book contains 21 therapeutic exercises and is arranged so that the physician can prescribe for the patient's specific needs.

Demands for this publication have been such that the first edition was sold out before it was announced in *Public Health Reports* in August. Health departments are distributing copies to physicians.

To prepare the illustrations in this book, approximately 250 photographs were taken of the more typical procedures used in treating hemiplegic patients. Drawings were made from the photographs selected by a group of consultants who assisted in the development of the book.

Developing an Ordinance and Code for Food Vending Machines

WILLIAM C. MILLER, Jr., M.S.

THE AUTOMATIC merchandising of food has grown from the penny candy vendor to prototype machines which dispense an entire hot meal at the touch of a button. A billion dollars for foods and beverages was dropped into coin slots in 1957, and vending machines are now supplementing snack bars and cafeterias in many factories and offices.

With the rapid expansion of this type of food buying, many States and communities and the trade organization of the industry requested the Public Health Service to develop a model sanitation ordinance and code for vending machines. Culminating 4 years of study and investigation, the recommended ordinance on the vending of foods and beverages was published in July 1957 (*1*). This suggested legislation is not solely a product of the Public Health Service. It also represents the views of State and local health officials and the vending machine industry.

The development of model ordinances and codes for nationwide use is not an easy task. Such a document aims to meet every situation in every State and community. The definitive provisions must reconcile the strict public health point of view, which may not recognize some of the operating problems, and the strict industry point of view, which may not recognize some of the public health considerations. Accordingly, a model or suggested ordinance represents a series of compromises which afford maximum public health protection and yet can be attained in practice.

Mr. Miller is chief of the Food Sanitation Section, Milk and Food Program, Division of Sanitary Engineering Services, Bureau of State Services, Public Health Service. *This article is based upon a paper presented at the annual meeting of the South Carolina Association of Sanitarians, Inc., at Myrtle Beach, S. C., May 23, 1958.*

History and Growth

The history of automatic merchandising starts about 200 B. C.; the first vending machine of record dispensed holy water in a Greek temple in Alexandria, Egypt. In the early part of the 19th century, bulk tobacco was automatically merchandised in English pubs. Vending machines first appeared in the United States in the late 1880's. Penny gum and chocolate bars were dispensed in packages and salted peanuts and ball gum in bulk. Although cigars appeared in vending machines around the turn of this century, not until the mid-1920's were cigarettes so merchandised. Prior to World War II most vending machine operations were in the penny sales category (*2*).

During the past few decades, the vending industry has undergone phenomenal growth and technical change. Few facts and figures are available that accurately indicate the magnitude of the industry prior to 1950. However, personal observation and limited information indicate that food and beverage vending machine operations in the 1930's and early 1940's were primarily small businesses, with individuals owning and operating only a few machines.

Demands for inplant feeding during World War II increased the number of vending ma-

chines which assisted in meeting the needs for on-the-job refreshment. Subsequently, the automatic merchandising of foods and beverages in factories, office buildings, institutions, and other locations began to supplement and, in some instances, to replace the small cafeteria or snack bar.

The estimated total sales of products through vending machines in 1947 approximated a half billion dollars. In 1957, total sales exceeded $2 billion, about half of which were foods and beverages. The automatic vending of foods and beverages accounts for a large part of the increases during the past few years. For example, about 2,000 coffee vending machines were in use in 1949, with sales of about $1.5 million. In 1957, the sales of 70,000 machines dispensing coffee and other hot beverages were more than $135 million, an increase of 35-fold in machines and 90-fold in dollar sales. Similarly, sales of milk and milk products increased more than four times between 1953 and 1957. Sandwich and pastry sales have tripled since 1953 (*2*).

Until the last few years, most foods and beverages dispensed through vending machines were not readily perishable. However, as the industry expanded, the variety of products dispensed began to include many readily perishable products, such as hot and cold sandwiches, meat dishes, soups, and salads. Currently there are prototype machines which hold precooked frozen meals and dispense these meals hot in a matter of seconds. The expansion has introduced new products in food merchandising and public health protection normally not encountered in conventional food service businesses.

Requests for a Code

The earliest activities of the Public Health Service in connection with the vending of foods and beverages date back to the late 1940's. The changing character of automatic merchandising prompted a number of States and communities to request the Service to furnish opinions on the public health hazards of certain types of vending machines. Opinions delivered were based on the sanitation standards in the existing restaurant and milk ordinances and codes.

As the vending of perishable foods expanded, many States and communities requested the Service, in the interest of uniformity, to develop specific criteria which could be recommended for the sanitary control of foods merchandised in this manner. The National Automatic Merchandising Association, a trade organization representing the equipment manufacturers, the operators, and the suppliers, also requested the Service to formulate a model vending machine sanitation ordinance and code.

This work began in 1954. The Milk and Food Program of the Division of Sanitary Engineering Services made field studies of current practices in vending machine design, construction, and operation. The problems encountered were discussed in detail with individual State and local health authorities, representatives of the vending industry, and others concerned. Conferences were held with groups and individuals who had or were engaged in research related to vending machines.

Next, existing ordinances and regulations specifically concerned with the sanitary control of vending machines were reviewed. In 1954, only six local health departments reported that they had adopted such regulations; however, many indicated they felt there was a need for sanitary control of food and beverage vending. The most comprehensive standards reviewed at that time were those developed for the Armed Forces by the Subcommittee on Food Supply, Committee on Sanitary Engineering and Environment, National Research Council. The industry representatives indicated that the general criteria established in these standards were practical for all types of vending operations, although the standards were limited to coin-operated, bulk-type vending machines which dispensed beverages or liquid foods.

The first working draft of the ordinance was completed in 1955 and was discussed with members of the industry. In April 1956, the second working draft was submitted for review and comment to all States, a representative number of communities, several Federal agencies, the vending machine industry, and interested groups and persons. More than 800 groups and individuals had the opportunity to review and comment on the second draft, and their comments proved invaluable in preparing The Vending of Foods and Beverages for publication.

Basic Assumptions

The ordinance and code is based upon several major assumptions. The first is that it will be adopted only by jurisdictions having established food sanitation programs. Accordingly, the criteria of existing programs are the basis for the acceptability of foods, beverages, and ingredients; acceptability of the commissaries providing the foods, beverages, ingredients, supplies, and equipment; and acceptability of cleaning methods and bactericidal treatment of the surfaces of the machine in contact with the product. Second, ordinance provisions should be directed primarily toward the protection of readily perishable foods, but should cover public health considerations of vending machines dispensing all types of products.

And third, vending machines are unique; generally they are unattended food dispensing devices and must be self-contained units with the necessary built-in controls for protection of foods or beverages. In reference to this, it is recognized that the health authority, as well as industry, may find it desirable to cover automats, or attended vending machines, under the existing regulations for food service establishments. If this procedure is followed, such businesses should conform fully to the requirements for food service establishments.

The format of the ordinance has been designed to permit flexibility in methods of enactment or adoption. It includes a short enabling form for use by those jurisdictions where adoption by reference is legal. Use of this form reduces cost of publication and printing and facilitates keeping the ordinance up to date. To be adopted only as an ordinance, the code material concerning satisfactory compliance under section V should be deleted. The unabridged version has been arranged and presented in a form that can be adopted as an ordinance and code. When the unabridged form is adopted, section IX, enforcement interpretation, should be deleted.

Briefly, these are the major provisions of the ordinance.

Section I defines the terms used in interpretation and enforcement. This is an essential section of any regulation because specificity of intent must be delineated both for those administering the ordinance and for those regulated by it. Such terms as "vending machine," "commissary," "machine location," "readily perishable food," "operator," "employee," and "health authority" are defined.

A surprising difficulty was encountered in trying to define "readily perishable foods." Most of those concerned with food sanitation have a pretty firm idea of what is meant by "readily perishable foods." But try to write a definition that is clear, concise, and definitive! To find one, the counsel of representatives of the Food and Drug Administration, the offices of the Surgeons General of the Army, Navy, and Air Force, the National Institutes of Health, universities, and State and local health departments was sought. The definition in section I reflects the combined thinking of a group of people primarily concerned with food protection.

Permits

Permit requirements are normally a part of most food sanitation laws or regulations and from a public health point of view are a registration device to give the health authority a measure of the magnitude of operations requiring program coverage. Section II of the ordinance establishes for permits requirements governing application, issuance, suspension, revocation, and reinstatement.

It soon became obvious in developing permit requirements that they could become an administrative monstrosity to the health authority and the operator. A large number of operators or a single operation of any size would make it almost impossible for the health authority to maintain a current list of all machine locations. Therefore, the operator is required to maintain such information and to make it available to the health authority of the jurisdiction upon request. Permits are not required for each machine but are issued to each operator. The operator's permit number, of a size and style approved by the health authority, should be conspicuously displayed on each vending machine so that in a public health emergency involving a given machine, the health authority can readily identify and contact the responsible operator.

In applying for an operator's permit, the applicant must advise the health authority of the

products to be dispensed, and whether the products will be dispensed in bulk or packages. To keep his permit, the operator must also notify the health authority of any change in types of vending machines or conversion of existing machines to dispense products other than those for which the permit was first issued. Permits, of course, are nontransferable.

Section III prohibits the sale of misbranded or adulterated foods or beverages, and provides for the examination and condemnation of such products.

The inspection of vending machines and commissaries is covered in section IV. Vending machines dispensing readily perishable foods or beverages and all commissaries should be inspected at least once every 6 months. Machines dispensing other than readily perishable products, for example, peanuts, popcorn, and carbonated beverages, should be inspected as frequently as the health authority deems necessary and practical. In addition to authorizing and requiring inspections, this section requires the operator to provide the health authority with access, either in the company of an employee or otherwise, to the interior of all vending machines he operates.

The health authority is required to notify the operator of unsatisfactory findings of an inspection and to establish a specific, reasonable period of time for correction. When conditions are grossly insanitary, or a substantial hazard to the public health exists, the health authority can, with due process, require the immediate discontinuance of operation.

Sanitation Requirements

The sanitation requirements for vending machines and their operation are set forth in section V. Obviously these requirements must be based on the type of food or beverage dispensed. For example, the vending of prepackaged chewing gum hardly presents a danger to the public health, but the vending of milk, sandwiches, salads, and a variety of other readily perishable foods can be potentially hazardous. This section is concerned primarily with the vending of perishable foods and beverages; however it also includes general provisions which are applicable to all vending machines. An effort was made to cover by specific requirements particular foods or types of vending operations which present a potential health hazard.

Section V is quite detailed and is presented in eight parts. Part A concerns the protection and wholesomeness of foods, beverages, and ingredients, at their sources and in the vending machine, and the protection and maintenance of surfaces of containers and equipment in contact with the product. It requires that readily perishable foods within the vending machine be held at a temperature not higher than 50° F. or not lower than 150° F., whichever is applicable.

Controls are required to insure the maintenance of these temperatures at all times, provided that an exception may be made for the actual time required to fill or otherwise service the machine, and for a recovery period of 30 minutes following the filling or servicing operation. These controls are required to be such that, in the event the temperature in the food storage compartment rises above 50° F. or falls below 150° F., the machine is placed in an inoperative condition until serviced by the operator. The food storage compartment of vending machines dispensing readily perishable foods must have a thermometer with an accuracy of $\pm 2°$ F.

Two points about the temperature controls should be emphasized. First, the 30-minute bypass of the machine cutout is not required but is permitted because of a practical operating problem. The possible public health hazard is calculated to be relatively small. Second, if at the end of this 30-minute period and at any time thereafter, the temperature of the food storage compartment fails to meet required standards, the dispensing mechanism must become inoperative pending the operator's reservicing of the machine. Thus, unless the readily perishable products put into the machine at servicing meet temperature requirements, the machine is likely to become inoperative after not more than 30 minutes.

Milk and fluid milk products offered for sale through vending machines must be dispensed only in individual, original containers or from bulk containers filled at the milk plant. This requirement is excepted when the fluid milk

product is an ingredient in liquid foods or beverages dispensed at 150° F., such as in a coffee machine. In this circumstance, the milk product may be transferred at the machine location from the original container of not more than one-half gallon capacity to the vending machine bulk container which is clean and which has been subjected to approved bactericidal treatment. In such a transfer, the entire contents of the original container must be used.

This exception is a necessary compromise, since dairy-filled containers for fluid milk products, suitable for vending machine use, were not available at the time the ordinance was developed. It is understood that several equipment manufacturers are working on this problem with promise of success.

The cleaning, filling, and protection of containers used in bulk milk vending machines are consistent with the provisions for bulk milk dispensers as set forth in the milk and restaurant ordinances recommended by the Public Health Service.

All parts of vending machines in contact with readily perishable products are required to be cleaned and bactericidally treated daily, unless these parts are kept at all times at a temperature not higher than 50° F. or not lower than 150° F. The frequency for cleaning the contact surfaces and parts of other types of vending machines, such as carbonated beverage or popcorn machines, is established by the health authority. The operator should maintain within machines of this type a date record of cleaning and bactericidal treatment. Protection of single service containers used in vending machines dispensing foods or beverages in bulk is also specified.

Other Requirements

Part B requires that the machine's location have a minimum potential for contaminating the product and that the location be easily cleanable and kept clean. Part C, exterior construction and maintenance, specifies that machines be sturdily constructed and that exteriors be designed, fabricated, and finished to facilitate cleaning and minimize the entrance of vermin. Screens for ventilation louvers are required; however, because of the large number of machines currently in use which are not screened, the requirement is deferred for these machines until they are relocated or removed from present locations for any other purpose.

Part D, covering interior construction and maintenance, provides that all interior surfaces and component parts of vending machines be so designed and constructed as to permit easy cleaning and being kept clean. It further requires that all surfaces in contact with the product be smooth, nontoxic, corrosion resistant, and be made of relatively nonabsorbent material. Such surfaces must be protected from contamination and be capable of withstanding routine cleaning and bactericidal treatment.

Inplace cleaning of pipes and tubing of all machines dispensing other than readily perishable foods is permitted. This practice is acceptable if pipes and pipe fittings are so arranged that cleaning and bactericidal solutions can be circulated throughout the system, these solutions contact all interior surfaces, the system be self-draining or otherwise completely emptied, and the procedures result in thorough cleaning. The vending stage of all bulk food or beverage machines must have a tight-fitting, self-closing door or cover that remains closed except when food or beverage is delivered.

Part E provides that water used in vending machines be from an approved source and be of a safe, sanitary quality. Water used as an ingredient of the product must be piped into the machine under pressure, with connections and fittings installed in accordance with local and State plumbing regulations.

While the water supply provisions of this ordinance were being developed, information was received concerning several outbreaks of illness attributed to copper poisoning from post-mix carbonated beverage machines. In almost every instance, investigation revealed that there had been a breakdown of the check valve in the water supply line upstream from the carbonator. Specific provisions were therefore developed to protect against such occurrences.

Post-mix carbonated beverage machines are required to have two check valves or a double one; or an air gap; or a device to vent carbon dioxide to the atmosphere; or other device

approved by the health authority which will prevent carbon dioxide or carbonated water from entering the water supply system. All contact surfaces downstream from the protective device are required to be of such material as to preclude the production of toxic substances which might result from interaction with carbon dioxide or carbonated water. If check valves are used, a screen of not less than 100 mesh to the inch must be installed in the supply line immediately upstream from the valves. This screen is to remove any particulate matter which might lodge between the valve and its seat and which might be of sufficient size to nullify the valve's purpose.

Part F, waste disposal, states that all trash and other wastes must be removed from the machine location as frequently as necessary to prevent nuisance and unsightliness and must be disposed of in an approved manner. Machines dispensing liquid products in bulk should have containers to collect drip, spillage, overflow, or other liquid wastes. An automatic shutoff is required which will place the machine out of operation before the liquid waste container overflows.

Part G requires that foods, beverages, and ingredients, and the surfaces of containers, equipment, and supplies in contact with the product be protected from contamination while in transit to machine locations. Further, readily perishable foods while in transit must be maintained at a temperature not higher than 50° F. or not lower than 150° F. This provision does not necessarily require a refrigerated or heated truck, but does require maintenance of these foods at appropriate temperatures. A well-insulated container might suffice, depending on the distance and size of the operation.

That employees have clean hands and wear clean outer garments while handling foods, beverages, and surfaces in contact with products are not only standard requirements in food ordinances but are good business practices as well. This provision is in part H.

Sections VI and VII provide for communicable disease control related to vending machines, and for necessary action when disease is suspected.

Some automatic merchandising businesses are both intrastate and interstate operations. Section VIII provides for reciprocal inspection of commissaries and permits the health authority to accept reports from the responsible health authorities in other jurisdictions where commissaries may be located.

Enforcement interpretation, penalty provisions, repeal and date of effect, and the unconstitutionality clause, all standard provisions, are set forth in sections IX, X, XI, and XII, respectively.

Industry Efforts

It would be remiss to fail to recognize the industry's part in the promotion of vending machine sanitation. Only a few small outbreaks of illness attributed to foods or beverages from vending machines have been reported to the National Office of Vital Statistics. However, the rapidly changing technology in this type of food service has substantially increased the potential for foodborne outbreaks. This potential was recognized early by a number of forward-looking members of the vending machine industry. Led by the Public Health Committee of the National Automatic Merchandising Asscciation, vending machine manufacturers and operators assisted in the development of the ordinance and code and have endorsed its provisions. In addition, many of the new vending machines are already being designed and fabricated with greater attention to sanitation, and an aggressive public health program has been initiated by and for the industry.

Adoptions

California and Indiana are using the recommended ordinance and code as the basis for State laws or regulations. Many of its provisions are being incorporated into New York City's sanitary code, which is currently under revision. It is also serving as the basis of vending machine sanitation requirements being prepared by the District of Columbia and the city-county of Denver.

Total implementation of the vending machine ordinance and code, whether at State or local levels, ultimately depends upon the development of genuine cooperation, personal as well as official, between sanitarians and vending

machine operators. In the interest of effective vending machine sanitation, it is suggested that health officials get to know the operators in their jurisdictions. By making some rounds with local operators, sanitarians can become acquainted with machine operations and servicing and learn the public health and operational problems associated with various machines. The result will be a sharing of "know how" and an interchange of ideas and experiences. This sort of cooperation pays big dividends in the area in which we all work—the protection of the health of Americans everywhere.

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(*2*) National Automatic Merchandising Association: Annual directory of automatic merchandising. Chicago, 1954–57.

technique

Nutrition Quiz

A nutrition quiz for dental hygienists of the New York City Department of Health was held April 26, 1957, at the Fort Green Health Center in Brooklyn. The idea for this quiz originated with the borough consultant in dentistry for Brooklyn, who was looking for a stimulating and novel training activity.

Nutrition has always been an integral part of the Brooklyn dental hygienists' inservice training. Customarily, nutrition consultants and supervising dentists from the New York City Department of Health plan group meetings, often held during school vacations, and hold conferences with individual hygienists on specific problems during this inservice training.

Representatives from the hygienists' group, the borough consultants in dentistry and nutrition, the supervising dentist, and three district nutritionists attended a planning session for the quiz. It was decided that the hygienists would volunteer to study specific nutrients such as vitamins, protein, and minerals as well as calories. Each hygienist was expected to study her topic and to become a "specialist" in answering questions concerning it. The hygienists also agreed to submit questions on their chosen topics.

These questions were then edited and revised by the dentists and nutritionists. The questions were geared to personal nutrition needs as well as those the hygienists met in the field.

For the quiz, all of the 50 hygienists attending were divided into two teams, each with a captain. Each team had its own specialists who had studied their respective nutrients. The consultant in dentistry acted as quiz master, hygienists as team captains and timekeepers, and nutritionists as scorekeepers.

Typical questions were: Define a vitamin. Give five symptoms of a vitamin C deficiency. Name five results of insufficient dietary protein. Is it true or false that fruit is low in calories?

Questions were put first to nonspecialists who earned a score of 2 for a correct reply within 30 seconds. A question unanswered within this time limit was turned over to a specialist, whose reply was worth one point. The nutritionists, as they kept score, made notes of challenged answers, points needing explanation, and questions which no one answered correctly. Fifty-five questions were posed during the hour-and-three-quarter morning session.

The nutritionists used the luncheon following the quiz to dramatize the subject of nutrition. Each platter of food on the buffet table bore a sign identifying its nutritional value.

The participants' interest remained high for the afternoon session when the nutritionists took up debated and unanswered questions. Using teaching devices such as bar graphs and posters, they explained points brought up during the quiz, stimulating further discussion.

The day's activities culminated with the announcement of the quiz prize winners. Prizes provided by the nutritionists for each member of the winning team were oranges, grapefruit, carrots, spinach, escarole, chicory, green celery, apples, and cans of dry, nonfat milk solids.

—Hilda Kreigenhofer, *borough consultant in nutrition, bureau of nutrition, New York City Department of Health.*

Machines that vend carbonated beverages have occasionally been the source of copper poisoning. Poisoning can be prevented if contact between copper lines and carbonated water is precluded.

Copper Poisoning From Vending Machines

SAMUEL H. HOPPER, Ph.D., and HAROLD S. ADAMS, B.S.

SEVERAL health departments have reported cases of illness that appear to be copper poisoning associated with carbonated drinks obtained from vending machines. These machines, the post-mix type, release 1 ounce of a flavored syrup into a cup and then add 5 or more ounces of carbonated water.

In the reported instances of alleged poisoning, the individuals who became ill developed symptoms generally described as acute gastric upset about 12 hours after the vending machine had been in use. The cases of poisoning seemed to occur only after a faulty check valve allowed carbon dioxide to flow into a copper waterline connecting the machine to the building's water supply. Where there is a faulty check valve, the carbon dioxide usually flows back into the water supply because the gas pressure in the tank is greater than the pressure in the building's waterline.

Our investigation at the University of Indiana was conducted to determine whether copper poisoning could result from a carbonated beverage dispensed from a post-mix machine that uses a copper waterline.

Review of Copper Poisoning Cases

Case 1. Twelve persons became ill in a manufacturing plant at Kokomo, Ind., on February 13, 1952. Detailed accounts of sickness were obtained from five persons. There was extensive corrosion of the copper cylinder in a water filter. The carbon in the filter contained 0.43 mg. copper per gram, which is equivalent to 430 ppm.

Case 2. Information from the Office of the Surgeon General, Department of the Army, indicates that defective check valve on a machine at Fort Hamilton, N. Y., in January 1957, resulted in carbonation in the copper waterline. Three persons became ill and laboratory analysis showed 35 ppm copper in the water. Reports of carbonation in a waterline, with no reference to any illness, were also made for First Army Headquarters and a naval receiving station in New York.

Case 3. F. A. Korff of the Baltimore City Health Department reported in a personal communication that a 4-year-old boy was admitted to Union Hospital in Baltimore, Md., on April 3, 1957, with a complaint of vomiting, which started immediately after drinking a carbonated beverage from a vending machine. The child was sufficiently improved to be discharged from the hospital the next day. The laboratory report of his gastric washings showed copper salts, and the attending physician attributed the illness to poisoning from copper salts.

Case 4. J. H. Fritz of the Kansas City (Mo.) Health Department investigated illness of a 2-year-old girl which occurred on February 18,

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1957, near the city. The child became ill and vomited 15 minutes after drinking part of a carbonated beverage. The remainder of the beverage was taken by the child's grandfather to the city health department. Since the alleged poisoning occurred beyond the jurisdiction of the city health department, the laboratory of the Federal Food and Drug Administration was asked to analyze the sample. The laboratory found approximately 35 ppm copper. Investigation showed that a rubber check valve leaked and allowed carbonated water to lie in a copper waterline overnight. The first few drinks vended the following morning caused illness in eight persons, but only one sample of the beverage was available for analysis. Maintenance men from the company owning the machine replaced a faulty check valve before the Kansas City (Mo.) Health Department personnel arrived on the scene.

Case 5. The Los Angeles Health Department reported that two persons experienced nausea and vomiting within 15 minutes after drinking a carbonated beverage from a vending machine. Investigators found that a defective carbonator valve permitted carbon dioxide to back up into a copper waterline. Chemical analysis of the water from the carbonator indicated 260 ppm of copper (*1*).

Correspondence with the Los Angeles Health Department revealed that the check valve in question had a single ball held in place by a spring. A small particle which appeared to be a piece of a gasket had lodged under the ball preventing it from closing. A drink drawn from the machine contained 110 ppm copper, while water taken directly from the carbonator contained 260 ppm copper.

Toxicity of Copper

There is no single source of information on copper's toxicity. Information must be gathered from the official publications of a large group of professional agencies. Excerpts from some of these leave the impression that an exact figure for toxicity of copper in man cannot be given.

The Dispensatory of the United States of America (*2*) states that "copper is a constituent of all tissues of the animal organism; it is absorbed in the intestinal tract from food, which supplies about 2 mgm. daily." It is stored in the liver, and blood contains about 0.14 mg. per 100 ml., or 1.4 ppm. The possible deleterious effect of continued ingestion of considerable quantities of copper has been debated. Copper is not toxic in the same sense that lead, mercury, and nickel are toxic. Many of the soluble salts of copper when taken in a large quantity may give rise to gasteroenteritis. The phrase "large quantity" is not defined. Vomiting is usually so prompt that systemic poisoning does not occur.

Davenport (*3*) in an excellent review states that "there seems to have been, and still is for that matter, no unanimity of opinion regarding the toxicity of copper." She quotes from an editorial (*4*) on copper which said: "The danger from copper waterlines is slight. Copper is readily attacked by the various acids present in foods such as acetic, citric, malic, tartaric, and oleic. Consequently, any food or drink containing acid will dissolve a certain amount of copper if it comes in contact with that metal. There is no doubt that the human organism can take care of minute amounts of copper, but where the dividing line is between the harmless and the harmful amount cannot yet be said. Individual susceptibility probably enters in to complicate the problem. The danger from copper and brass pipes is negligible. Although copper cooking utensils might possibly be dangerous especially when used for fruits, the real risk comes from industrial hazards and from moonshine liquor."

Gleason and his co-workers state that in general the soluble ionized salts of copper are much more toxic than the insoluble or slightly dissociated compounds (*5*). The subacetate and the chloride forms are the most poisonous, with cuprous chloride being twice as toxic as the more common cupric salt. They go on to point out that no major toxicological distinctions are recognized between these two valences of copper. Only cupric copper was measured in our series of experiments.

Methods and Results

A post-mix type of machine was obtained on consignment to simulate field conditions for the

study (*A*). The other materials consisted of 3/8-inch copper tubing cut in 6-foot lengths, some valves, and a cylinder of carbon dioxide.

A 6-foot piece of copper tubing was filled with 100 ml. of carbonated water from the machine, which was connected to the building's water supply. One end of the tube was closed with a valve and the other end was connected to a cylinder of CO_2 under 75 pounds pressure. Tests were repeated 16 times for copper in tap water under pressure. Each ranged from 1 to 4 days in duration. The results varied from 0 to 10 ppm. All tests for copper were made by R. B. Forney, department of toxicology, Indiana University Medical Center, according to the diethyldithiocarbamate method (*6*).

Since the copper tubing was new, the inside of one tube was etched to see if it would, in this condition, release more copper. The tube was treated with 10 percent nitric acid for 20 minutes and then rinsed thoroughly. Carbonated water was used; the results were not different from those described above.

When an orange drink was used in two separate 24-hour tests, 4.4 and 7.6 ppm copper was obtained from each. At this point all results were regarded as essentially negative.

Table 1. Effect of 75 pounds of carbon dioxide static pressure on water or flavored drink in a copper tube

Number of trials	Contents of tube [1]	Length of test (days)	Copper (ppm)
16	Tap water	1–4	0–10
1	Tap water [2]	1	0–10
1	Orange drink [3] (noncarbonated)	1	4. 4
1	Orange drink (noncarbonated)	1	7. 5
1	Orange drink (noncarbonated)	1	5. 0
1	Cola drink (carbonated)	1	13. 0
1	Cola drink (carbonated)	4	25. 0
3	Orange drink (carbonated)	1–4	20–50
1	Orange drink (carbonated)	4	200. 0

[1] In all cases, the valve at one end of the copper tube was closed. The other end was connected to a cylinder of carbon dioxide.

[2] The tube was treated with 10 percent nitric acid for 20 minutes before using.

[3] The term "noncarbonated" means that the water for the drink did not pass through the carbonator in the machine.

The syrup lines are not connected to the waterline in post-mix machines. Hence a vended drink cannot back up into the waterline in the event of a check valve's failure. Despite this, an orange drink and a cola drink, made with 1 ounce of syrup and 5 ounces of carbonated water, were each kept in a copper tube for 24 hours under 75 pounds CO_2 pressure. The laboratory of the Indiana State Board of Health analyzed these samples in order to check on the previous work and reported that the orange drink contained 5.0 ppm copper and the cola drink 13 ppm copper, which approximated the amount we had obtained. Water under similar conditions showed 6.0 ppm copper.

For the next experiment a cola drink was put into the tube and held under 75 pounds CO_2 pressure for 4 days. The pH was 4.0 when the drink was removed, and it contained 25 ppm copper. An orange drink treated similarly had a pH of 3.5 and 200 ppm copper. Drinks not treated with CO_2 had a pH of 2.0 and less than 1 ppm copper. Carbonated water held for 4 days under 75 pounds pressure at pH 5.2 had 2 ppm copper. Repeated attempts ranging from 1–4 days with the orange drink gave copper in amounts of 20 to 50 ppm. As the summary in table 1 indicates copper was found in the acid drink that was allowed to stand in the tube. But the cause, we reason, could be due to either the acidity or to the type of drink. As a result, buffers were made to check on the effect of acidity.

Buffers were prepared according to Clark's method (*7*). Their pH varied from 2.6 to 5.0. Potassium acid phthalate and hydrochloric acid up to pH 3.6 were used in the preparation; the phthalate with sodium hydroxide added was used for pH 4.0 to 5.0. The tube was filled with buffer at pH 3.35 and kept at room temperature for 24 hours. No CO_2 was used. When the buffer was removed, its pH was 3.90 and it contained 200 ppm copper. A repeat experiment showed 166 ppm copper. In the next trial CO_2 was bubbled through carbonated water at pH 5.6 for 18 hours. The result was 3.5 ppm copper. However, when the pH was reduced to 5.0 and CO_2 was bubbled through the water for only 2 hours, the result was 25 ppm copper.

We thought that the amount of copper dissolved might be dependent upon whether the tube was new or old. A new tube was filled with buffer at pH 3.60 and was allowed to stand at room temperature for 21 hours. When the buffer was removed, its pH was 3.90 and it contained 600 ppm copper. For an old copper tube, we used the tube which had been etched with nitric acid some months previously and which had been used repeatedly. Buffer at pH 4.75 was put into this tube and kept at room temperature for 20 hours. When the buffer was removed, its pH was 4.80 and it contained 500 ppm copper. Thus, the age of the tube seemed to have no effect.

Table 2. Effect of pH on copper tube

Buffer (pH)	Time (hours)	Copper (ppm)
3.35	24	[1] 200
3.50–3.90	24	[1] 166
5.6	18	[2] 3. 5
3.60	21	[2] 600
5.0	2	[2] 25
4.75	20	[2] 500
4.0	2	[2] 400

[1] No CO_2 was used.
[2] CO_2 allowed to bubble through the tube.

It appeared at this point that copper would dissolve if CO_2 were bubbled through the water at a high enough rate to reduce the pH below 5.0. This reduction was easily accomplished. Carbon dioxide was bubbled through the water until the pH was 4.0 and the amount of copper was 400 ppm (see table 2).

At a pH below 5.0 using a phthalate buffer, large amounts of copper were dissolved. Tap water in a copper tube with CO_2 bubbling through it gave similar results. Thus, it was obvious that copper dissolves as the acidity increases. This lowering of pH occurs when CO_2 bubbles continuously through a copper tube containing water, and is similar to what happens when a faulty check valve is under CO_2 pressure higher than the water pressure.

The explanation for the phenomena reported remains obscure. In all probability the copper which is dissolved is not directly related to the pH, since a very strong acid is needed to dissolve copper. It would seem that the solubility of copper is dependent upon the presence of dissolved oxygen as well as carbon dioxide. There is ample dissolved oxygen in tap water to form an oxide of copper, which, in the presence of carbonic acid, gives enough copper ions to combine with naturally occurring sulfates and carbonates to appear in the vended drink. A faulty check valve permits carbon dioxide to bubble through the tube and allows enough circulation of water to supply the oxygen needed for the first step in the process.

Public Health Aspects

At the outset, it should be understood that copper poisoning does not represent a public health problem of any great magnitude, since the relatively few cases on record compared with the millions of soft drinks consumed would give an infinitesimally small case rate. To minimize copper poisoning, however, we suggest:

1. Vending machines should adhere to the sanitation code concerning the use of two check valves or a double check valve; or an air gap; or a device to vent the CO_2 to the atmosphere; or a device approved by the health authority (*8*).

2. A carbonator should not be made of copper. It should be made of an acid resistant nontoxic metal.

3. Water filters and water conditioning devices should not use a copper container.

Summary

If the check valves in a post-mix type vending machine do not function correctly, carbon dioxide may enter the water supply line. In the event that this line is made of copper, then (*a*) the CO_2 or carbonated water will react with the copper; (*b*) under certain conditions, the quantities of copper going into solution could be quite large; and (*c*) copper poisoning could occur from a beverage dispensed from a post-mix type, carbonated beverage machine.

Support is thus given to recommendations that these machines be designed and constructed so as to preclude contact between copper and CO_2 or carbonated water, and such machines be

equipped with a device or devices that provide positive protection against the backflow of CO_2 or carbonated water into the building water supply system.

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(8) U. S. Public Health Service: The vending of foods and beverages; a sanitation ordinance and code; 1957 recommendations of the Public Health Service. PHS Pub. No. 546. Washington, D. C., U. S. Government Printing Office, 1957, pp. E3, 13.

EQUIPMENT REFERENCE

(A) Post-mix type vending machine from Apco, Inc., New York, N. Y.

National Conference on Air Pollution

Municipal, county, and State health personnel, control officials, and scientists and technicians concerned with atmospheric pollution will meet with community leaders representing a wide variety of civic, industrial, and service organizations and agencies at the National Conference on Air Pollution in Washington, D. C., November 18–20, 1958.

Surgeon General Leroy E. Burney has called this conference, open to anyone interested in the subject, for two principal purposes: to create a wider understanding of air pollution problems among civic leaders, and to outline a practicable plan for future action in both research and control.

The program is designed to encourage maximum participation by all conferees. Following a day of orientation, during which participants will hear a status report from the Surgeon General and brief presentations on current knowledge and accomplishments, the assembly will divide into six discussion groups to formulate recommendations for desirable future activities.

On the morning of the third day, the six groups will present their recommendations to a plenary session. The final afternoon's program will resemble a "town meeting," with questions and discussion from the floor.

A steering committee comprising representatives of the American Public Health Association, American Municipal Association, Air Pollution Control Association, and other principal governmental, industrial, and scientific organizations have aided the Surgeon General and his staff in planning the conference.

Chairmen and vice chairmen of the discussion groups, in that order, are as follows:

Extent of air pollution: Dr. Arie J. Haagen-Smit and Dr. H. C. McKee.

Sources of air pollution: S. L. Hanauer and Dr. Leslie Chambers.

Health effects of air pollution: Dr. Malcolm H. Merrill and Dr. James P. Dixon.

Economic and social effects of air pollution: Dr. John T. Middleton and Arthur Crago.

Control methods and procedures for air pollution: Dr. Leslie Silverman and W. C. L. Hemeon.

Administrative aspects of air pollution: Dr. Louis C. McCabe and Harold W. Kennedy.

Miss Sleeper

Dr. Dearing

Mr. Mason

Dr. Arnold

New Members of the PHR Board of Editors

The Board of Editors of *Public Health Reports* has gained four new members. Appointed to the board for 3 years, they replace outgoing members Dr. Leo W. Simmons, Dr. H. Trendley Dean, Margaret Arnstein, and Vernon G. MacKenzie.

Francis A. Arnold, Jr., D.D.S., became director of the National Institute of Dental Research, Public Health Service, in 1953. He had served as associate director since establishment of the institute in 1948.

Dr. Arnold's entire professional career has been in the Public Health Service, which he entered in 1934 on graduation from the dental school of Western Reserve University. In 1937, he joined the Dental Research Section, National Institutes of Health, of which he became assistant chief in 1943.

A prolific researcher of international eminence in the dental sciences, Dr. Arnold is a fellow of both the American College of Dentists and the American Public Health Association. He is also a member of the American Dental Association and a former president of the International Association for Dental Research and is now vice president of the Fédération Dentaire Internationale.

W. Palmer Dearing, M.D., assistant director for health in the Office of Defense Mobilization, previously served for 9 years as Deputy Surgeon General of the Public Health Service.

After graduation cum laude from Harvard Medical School, Dr. Dearing taught epidemiology in the Harvard School of Public Health. He became a Public Health Service career officer in 1934, serving as an epidemiologist in studies of poliomyelitis and tuberculosis until 1941. That year he was assigned to the Office of Civilian Defense as assistant, and then, chief medical officer. In 1944 he was named personnel chief of the Health Division, United Nations Relief and Rehabilitation Administration, returning to the Public Health Service in 1945 as deputy chief of the Division of Public Health Methods. A year later he became chief of the Division of Commissioned Officers.

Karl M. Mason, M.P.H., was named director of the bureau of environmental health, Pennsylvania Department of Health, in 1954, after having served as the department's director of professional training since 1951. During 1949 to 1951, he was associated with the Public Health Service following 6 years as director of the division of public health engineering with the Peoria, Ill., Department of Health. Previously, he spent 2 years as public health engineer with two county departments of health in Michigan.

Mr. Mason is a diplomate of the American Academy of Sanitary Engineers and a member of the Advisory Committee to the Surgeon General of the Public Health Service on Water Pollution Control. In addition, he is the Pennsylvania representative on the governing council of the American Public Health Association and a lecturer at both the University of Pittsburgh Graduate School of Public Health and the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

Ruth Sleeper, R.N., has been director of the School of Nursing and Nursing Service of the Massachusetts General Hospital in Boston since 1946. She began her nursing career in 1922 when she graduated from the Massachusetts General Hospital Training School for Nurses. Miss Sleeper took a master of arts degree from Teachers College, Columbia University, in 1935 and holds the honorary degrees of doctor of humanities from Boston University (1953) and doctor of science from Hood College (1954).

President of the National League of Nursing Education during 1944–48 and of the National League of Nursing in 1952–55, she was also chairman of the Joint Commission for the Improvement of the Care of the Patient.

Her current posts include chairmanship of the Education Committee of the International Council of Nurses and membership on the Expert Committee on Nursing of the World Health Organization and on the Board of Directors of the National League of Nursing.

History of a Health Education Fellowship Program

IDA BRUGNETTI, M.P.H., and MAYHEW DERRYBERRY, Ph.D.

ACADEMIC TRAINING specifically in public health education prior to 1943 was received by relatively few. In 1943 the two schools offering such training, Yale University and the University of Michigan, had only seven students enrolled.

A demonstration project had been started under the sponsorship of the Public Health Service in 1941 in North Carolina. Its purpose was to demonstrate what a person trained in health education could contribute to the achievement of the goals of a public health program. By 1943, this demonstration led to a proposal to train more such personnel. As a result of a request from the Public Health Service, the W. K. Kellogg Foundation made two grants totaling $72,000 for the purpose "of increasing the number of qualified public health education personnel in the United States who could carry on the types of health education programs that had been demonstrated as being successful in North Carolina."

The steps developed to accomplish this purpose were:

1. To initiate a program for the training of public health educators in the University of North Carolina.
2. To stimulate and support programs of training then in existence at Yale University and the University of Michigan.
3. To encourage other schools of public health to establish training programs in health education.

This report, prepared 15 years after the initial grant, supplements previous summary reports of the program and describes some of the results.

Miss Brugnetti is a health education consultant assigned to the Illinois State Health Department, and Dr. Derryberry is chief of the Public Health Education Branch, Division of General Health Services, Bureau of State Services, Public Health Service.

To initiate the training of public health educators at the University of North Carolina it was decided to award fellowships directly to qualified individuals for a 1-year graduate course in public health education leading to the degree of master of public health. To be eligible candidates were required to have a baccalaureate degree which included a background in the natural sciences and social sciences. Preference was given those who had shown some degree of effective participation in community undertakings and who displayed skill in and an understanding of human relations.

For the majority of candidates, the fellowships completely financed their training, paying for tuition, field training, travel, and a monthly stipend to the individual. Others were awarded partial fellowships which paid only a portion of their expenses.

Extending the Program

In its second phase, the program was extended to Yale University and the University of Michigan. The two grants provided a total of 47 fellowships, 41 completely financed and 6 partially financed. Of these, 26 went to the University of North Carolina; 11 to the University of Michigan; 10 to Yale University. All the awards were to women, inasmuch as during the war men were not exempted from military or other essential employment to study specialties such as health education.

The program of study initiated in the University of North Carolina, with progressive modifications to meet the changing demands, is still operating. It has continued to develop, offering courses at the doctorate level, and since 1946, has been extended to North Carolina College.

Recruitment, training, and placement of the candidates who had completed specialized study in public health education helped to encourage other schools of public health to establish train-

ing programs in public health education. The sequence of events is best reflected in a review of the years when students in public health education were first enrolled in other schools of public health.

1945—University of Minnesota
1946—North Carolina College
1946—University of California
1948—University of Puerto Rico
1951—Harvard University
1951—Columbia University

All these schools are still training public health educators. Consequently, since 1943 the number of academically trained health education personnel in the United States has increased. In contrast to 1943, when 7 students were enrolled in public health education training, in 1958 the enrollment in schools of public health showed a total of 130 students. In addition to the students currently in training, reports indicate that approximately 1,250 persons have received academic training at the graduate level in public health education from 1943 through 1957. This total includes students in Puerto Rico, but does not include students from foreign countries.

Several additional results are also evident. When the Kellogg funds were expended, other agencies, both voluntary and official, began to support health education training. This trend has continued; 60 percent of the students enrolled in courses of public health education for the school year 1956–57 were sponsored either by official or voluntary agencies.

Schools which now provide training at the doctorate level are the University of California, Harvard University, and the University of North Carolina.

Increasingly for the past 10 years, schools have made their courses available to students from other countries. In many instances special training has been arranged for these students, whose needs differ radically from those of Americans.

Health Leadership

Health leadership both in this country and on the international scene has come from among the candidates who studied under the Kellogg Foundation Fellowships. The positions which the fellows currently hold reflect the impact of the fellowships that were awarded from the two grants.

For this phase of the report the graduates were asked to submit a summary of their professional activities since the completion of their health education training. The questions were open-ended; consequently, there is not complete uniformity in the responses. Nevertheless, all the data received are included in this summary.

In March 1958, data were obtained on 38 of the 47 candidates. Of the other 9, 1 is deceased, 1 entered a religious convent and no information is available as to whether she worked previously in public health, 4 persons did not respond to the letter of inquiry, and 3 could not be located. Of the 38 candidates who responded to the letter of inquiry, 24 received their training at the University of North Carolina, 7 at the University of Michigan, and 7 at Yale University. Three of them have since taken further graduate work and obtained doctorates of philosophy, and a fourth is currently enrolled in a course leading to the doctorate degree.

Following completion of the training, 37 of the 38 did work as health educators for varying periods of time. Employment in health education ranged from less than 1 to 15 years with a median of 7½ years. The one candidate who did not work in this capacity married immediately following graduation, and although she did work for 6 months on a health project, it was not as a health educator. Currently, 22 of the 38 respondents are employed, 18 in health education positions and 4 in other fields.

Since all fellowships were awarded to women, marriage could be expected to remove a large portion of them from the labor market. Twenty-five have married, and they have usually withdrawn from employment at the time of marriage. However, several have returned to work after varying periods of absence. As a group they have worked in health education from less than 1 to 11¼ years with a median of 3¾ years. Currently 9 are employed: 5 in health education positions, 3 in teaching, and 1 as a laboratory technician.

Several of the respondents indicated they hope to return to active employment when their

children mature. Another factor possibly influencing the employment of married women is their place of residence. The women who listed teaching as their current work are residing in small towns where positions in health education may not exist. However, no data are available regarding this point or the preference for teaching school by the graduates.

Of the 13 respondents who are not married, all appear to have worked in health education since their graduation and are still working in a variety of types of agencies and positions. The length of such employment has varied from 9 to 14⅔ years with a median of 12⅔ years. The positions these graduates hold are:

Consultants for State boards of health: 3.

Consultants in the International Cooperation Administration, serving ministries of health in other countries: 2.

Consultants in the Indian Health program of the Public Health Service: 2.

Consultant in the National Tuberculosis Association: 1.

Health educators in Public Health Service regional offices: 2.

Faculty member of a school of public health in a State university: 1.

Professor of health education in a State university: 1.

Supervisor of health and physical education in a State department of public instruction: 1.

Fourteen respondents provided the unsolicited information that, although they were not currently in paid employment as health educators, they had participated as volunteers in a wide variety of health programs. These activities included:

Organizing the city for a poliomyelitis drive.

Serving on the American Red Cross health committee.

Chairing the health committee of the community chest.

Working with citizens groups to improve the State's public health laws.

Member of board of directors of the mental health society.

Member of board of directors of a tuberculosis association.

Teaching mothers' classes in the town's nursing service.

President of a State education association.

Committee member of the maternal health association.

Chairman of the YWCA health committee.

Member of the Committee on Local Resources of the League of Women Voters.

Health chairman of a parent-teacher association.

Education director of the citywide X-ray survey.

Member of the executive committee of a tuberculosis and health association.

Secretary of a community health council.

Member of the national board of YWCA.

Member of a local council of Girl Scouts of America.

Summary

The fellowship program of the W. K. Kellogg Foundation financed the training of 47 public health educators and stimulated the expansion of such training for more than a thousand others. Today, 15 years after the awarding of the first fellowship, a review of the professional activities of 38 of the 47 candidates who were awarded fellowships finds many of them in responsible positions in the public health field.

The New York State Interdepartmental Health Resources Board enables State agencies concerned with physical and mental health to achieve concerted action.

An Interdepartmental Approach to Health

I. JAY BRIGHTMAN, M.D.

SEVERAL UNITS of government are concerned with health and medical care. Departments of health, as well as mental health agencies and hospitals that are organized as separate government units, are primarily responsible. Departments devoted to social welfare, education, correction, and labor (including workmen's compensation) also have as a secondary function a share in health matters.

Very often the health functions of these departments are closely related or identical, the difference being limited to the population groups served by the specific agencies, the nature of the health matters coming under their jurisdictions, and the professional disciplines available to them. Cooperation among the departments and coordination of their efforts are necessary if unbalanced or conflicting approaches are to be avoided and effective programing achieved.

The New York State Interdepartmental Health Resources Board was established by an act of the 1956 State legislature to permit joint planning, coordination, and program development of physical and mental health matters that concern two or more State departments or agencies.

In an editorial comment on the development of the board, Dr. Herman E. Hilleboe, New York State's commissioner of health, stated: "In an era when it would appear that governmental agencies are ever expanding, it is heartening to note the establishment of the Interdepartmental Health Resources Board which actually replaces two former health units of New York State government. The establishment of this board is a step forward in efficiency and economy in government affairs in the field of human resources" (*1*).

The replaced health units to which Dr. Hilleboe referred were the Interdepartmental Health Council and the Mental Health Commission. The council, organized in 1947 on a directive from the Governor, included the commissioners of health, education, social welfare, and mental hygiene, and a member of the State legislature. The council met monthly to study problems in public health of interest to the several departments in order to determine the extent to which the State programs were meeting their objectives, and to make recommendations accordingly. It performed a useful service in the exchange of information and ideas on departmental activities in various health fields and in conducting special studies through interdepartmental committees. Since the council was not established by a legislative act as an executive agency, however, it had no official status. It received no funds of its own and could neither employ a full-time staff nor contract with outside agencies for special projects. Its limited staff work was carried out by the executive director of another State agency, the Joint Hospital Survey and Planning Commis-

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sion, who generously and effectively contributed whatever time he could spare from his very busy schedule.

The Mental Health Commission was formed by a legislative act in 1949 and included as members the commissioners on the Interdepartmental Health Council, plus the commissioner of correction. The commission had a full-time staff of administrators and research workers, and it was able to develop several major research projects in the field of mental illness and mental retardation. It also developed the basic groundwork upon which the New York State community mental health services program was established in 1954.

It was the unanimous decision of all commissioners concerned that interdepartmental work in both physical and mental health could be more effectively implemented and developed through a single, organized State agency. Their recommendations to this effect were accepted by the Governor and the necessary legislation was passed to establish the Interdepartmental Health Resources Board on April 1, 1956, for a period of 4 years.

Organization

The membership of the Interdepartmental Health Resources Board includes the commissioners of health, mental hygiene, education, social welfare, labor, and correction, the chairman of the Division of Parole and of the Workmen's Compensation Board, and the executive director of the Joint Hospital Survey and Planning Commission.

A chairman is elected annually by a vote of the members, with no member serving in this capacity for more than 1 year at a time. The commissioner of mental hygiene, Dr. Paul H. Hoch, served as chairman during the first year. He was succeeded by the commissioner of social welfare, Raymond W. Houston.

The board is responsible to the Governor and the State legislature and must submit to them an annual report of its activities and such recommendations as it may deem appropriate.

The legislation empowered the board to employ an executive director with the responsibility of carrying out its administrative duties in accordance with its established policies, rules, and principles. After considering the responsibilities of the executive director, the board decided during its early meetings that the position could best be filled by a physician with training in public health and with considerable administrative experience. At the present time, the executive director is assisted by a staff consisting of a nonmedical assistant director trained in public health administration, a biostatistician, a secretary, a stenographer, a typist, and an account clerk. In addition, the board is authorized to request assistance from any member, department, or agency that will enable the board to carry out its activities properly.

Determination of Assignments

The general objectives of the Interdepartmental Health Resources Board are (*a*) to provide for joint planning and program development in health matters of interdepartmental concern, and (*b*) to formulate and execute research studies and demonstration programs that will provide the board and member agencies with information and guidance for long-term planning.

Specific projects may come under the board's jurisdiction through several channels which may be classified as follows:

1. Functions specifically designated by the 1956 legislative act which established the board. This act outlined projects which might be undertaken in health services for the aging, rehabilitation, mental retardation, services for emotionally disturbed children, and alcoholism.

2. Functions specifically assigned the board by other legislation. For example, an act passed by the 1956 session of the State legislature gave the board, as successor of the Mental Health Commission, responsibility for establishing pilot centers for diagnosing mental retardation in children and counseling parents.

3. Functions assigned by special budgetary appropriations to the board. In the 1956 State budget, the establishment of a pilot facility for adults addicted to narcotics was delegated to the board when the latter became functional.

4. Special studies requested from the Gov-

ernor's office. In 1957, there was considerable pressure upon the State legislature and the Governor's office to license chiropractors in New York State. The Governor's office, aware that several State departments would be affected by such legislation, requested the board to study the matter. In another instance, after the Governor's conference on financing health costs for the aging in December 1956, the recommendations made by the three sections of the conference were referred to the board by the Governor's special assistant on problems of the aging for analysis and recommendations.

5. Special projects accepted by the board after its consideration of suggestions referred by outside agencies, such as the request of the State medical society for a study of the standards for orthoptic technicians working under the supervision of ophthalmologists.

6. Special projects accepted by the board upon consideration of recommendations made by one of its members, by its executive director, or by one of its advisory committees. For example, the commissioner of education, a member of the board, requested that the board undertake a study of the problem of "baby nurses," a term used for women who have taken courses in maternity and infant care at unlicensed schools. Although possible violations of the Nurse Practice Act were involved, the problem was referred to the board on the basis that it was of equal concern to the departments of health, social welfare, and education.

In planning its work, the board believes that its activities in joint planning and program development should continue as long as such activities are considered by the board members to be productive and beneficial. However, in accord with the philosophy underlying the board's establishment, research and demonstration projects must either be self-limited or be transferable to an appropriate permanent State administrative agency at a feasible time. The board is not to engage in long-term operating activities on any one particular program.

Methods of Operation

The functions of the board are carried out through one or more of the following methods:

By direct operations of the board's staff. Obviously the small size of the board's staff, with 4 of the 7 persons in nonprofessional grades, would curtail the board's activities if the staff was its only outlet for operations. The staff is the board's working arm and is responsible for initiating all of its functions. However, a considerable part of its work is done through the arrangements described in the remaining paragraphs of this section.

Through the operations of special board committees. For each major function undertaken by the board, there is a board committee whose individual members are experts from various disciplines and are appointed by the commissioners concerned with the problem at hand. The committees meet regularly with the executive director, assist in planning and developing projects, and put at the disposal of the director and board the required facilities and services of their respective departments.

Through advisory committees in special fields. The advisory committees meet about four times yearly and consist of experts in their respective fields, not associated with government. Their responsibility is to recommend new areas for exploration and to explain the board's functions and projects to appropriate professional groups and to the public.

By contracts with universities, medical schools, or hospitals. These agree to undertake special studies with financial assistance obtained by the board. In this way, the board has been able to carry out several major research projects on mental retardation and mental illness among children and on chronic alcoholism.

By joint studies with professional associations and voluntary health agencies. For example, the board is cooperating with the Hospital Association of New York State in a study of admission of chronic alcoholics to hospitals. The study of orthoptic technicians, referred to above, was a joint undertaking with the New York State Medical Society.

Examples of Activities

From the beginning, it was evident that one important aspect of the board's operations applies to all activities and is requisite to the

board's proper functioning in joint studies, planning, and program development. The board obviously offers an organized means of exchanging information among the member agencies on their specific health problems, on their individual philosophies and policies, and on the development of new programs which may be related to, and may serve or be served by, the operations in other agencies.

This function applies equally to the regular board meetings attended by the commissioners and agency directors and to the meetings of the special interdepartmental committees.

The major activities of the board encompass the fields of rehabilitation, aging, mental retardation, emotional disturbances in children, and alcoholism.

Rehabilitation

The committee advises the Joint Hospital Survey and Planning Commission on the construction of rehabilitation facilities.

Projects developed by the division of vocational rehabilitation of the State education department are considered by the committee in relation to the needs and resources of the projects.

The committee is offering technical guidance to the rehabilitation survey of the workmen's compensation program.

A subcommittee served on a joint advisory committee for the northern New York rural rehabilitation survey which was completed during the summer of 1957. This was a joint effort of the Saranac Lake Rehabilitation Guild, the State University College of Medicine at Syracuse, and the New York State Department of Health. Because of the project's interdepartmental nature, the commissioner of health requested the committee on rehabilitation of the former Interdepartmental Health Council to represent it on the advisory committee. This function was carried over when the board was established.

The purpose of this survey was to identify disabled persons in the northern New York rural area, to determine their needs in relation to vocational goals or increased self-sufficiency, and to determine the necessary facilities and personnel required to meet these needs. The subcommittee representing the State in this project included the assistant commissioner for vocational rehabilitation and the director of the division of vocational rehabilitation of the State education department, the assistant commissioner for medical services of the State department of health, the executive director of the Joint Hospital Survey and Planning Commission, and the executive director of the Interdepartmental Health Resources Board.

The committee is currently engaged in a study of job vacancies in rehabilitation, including physical, occupational, and speech therapy, clinical psychology, rehabilitation counseling, and medical and psychiatric social work. In this connection, it is working with the New York State Department of Civil Service and is attempting to define the factors which make it possible to fill some positions while other positions remain vacant. The committee offers a booklet on scholarships available to residents of New York State in rehabilitation work. This booklet has been distributed to rehabilitation facilities, medical schools, hospitals, and voluntary agencies throughout the State.

Recognizing a lack of knowledge and understanding of the services for epileptics in New York State, the committee published a statement in the *New York State Journal of Medicine* outlining the services available in vocational rehabilitation, selective placement, health, and mental hygiene, and put reprints at the disposal of rehabilitation medical facilities throughout the State.

The committee is analyzing the objective of sheltered workshops operating in New York State as well as the extent to which such objectives are being met, the cost of operation, and the methods employed. The committee is also seeking to determine what will be needed to expand this important service.

Realizing that a large number of disabled persons are not receiving services, the committee is studying the extent of State rehabilitation services and the possibility of their expansion.

At the request of the commissioner of correction, the committee is examining disabilities in State correctional institutions, with Attica Prison and Elmira Reformatory serving as pilot studies. The purposes are to determine the extent to which disabled inmates require

rehabilitation services and to develop a mechanism whereby such services may be received.

Also under study is the care of young adults who have no potentialities for further rehabilitation, who are unable to provide care for themselves, and who cannot be suitably placed in infirmaries or nursing homes because of the predominantly elderly population of these institutions.

Aging

The legislative act on aging which founded the Interdepartmental Health Resources Board requested it to develop and formulate "a master plan for establishing responsibility for planning, financing, administering, and coordinating the total array of personal health and mental health services to the elderly." Based on its review of reference materials, plus its evaluation of the current State and local programs, the board's Committee on Health Services for the Aging analyzed (*a*) the specific mental and physical health needs of the aged, (*b*) the resources available in the State to meet these needs, (*c*) the deficiencies in meeting these needs, and (*d*) recommendations for overcoming the deficiencies.

The board drew this material together as a planning guide for the executive office and the State legislature.

Retarded and Disturbed Children

The board has established three pilot clinics to provide diagnostic services for mentally retarded children and counseling for their parents. It is also studying these clinics and similar facilities to determine their role in meeting community needs. In addition, several research projects have been completed or are underway on such matters as the adjustment of the severely retarded adult in the community, the preinstitutional workup of the mentally retarded person entering State schools, and the psychological and social development of children in classes for the severely mentally retarded.

A major study is being completed on characteristics of emotionally disturbed children referred to residential treatment centers. A similar study is underway on children referred to day-care centers.

Alcoholism

The board supports a major research center on alcoholism at the State University College of Medicine in Brooklyn. It expects that the findings here may be used in clinics throughout the State. In addition, the board has established a training program for persons in various disciplines who are engaged in or plan to engage in community control of alcoholism. For the development of clinics at the community level, the board is working closely with the division of community mental health services of the department of mental hygiene. At present, the board's Advisory Committee on Alcoholism is studying the State program in order to develop a more comprehensive approach.

Discussion

With its year and a half of operating experience, the New York State Interdepartmental Health Resources Board has effectively achieved interdepartmental cooperation, planning, and program development. With a full-time staff and the authority bestowed upon it by the State legislature, the board has made a positive approach to complex health problems involving several State departments and often many other agencies, and has formulated recommendations based on the accumulation of pertinent information and the exercise of sound deliberations.

The board's monthly meetings have permitted the functioning of its staff and of the committees and agencies working with that staff to be reviewed, and have resulted in a stimulating exchange of opinions on matters of joint and mutual concern. Matters of particular urgency may be taken up at any time through special meetings of an executive committee consisting of the commissioners of education, health, mental hygiene, and social welfare. Of particular importance, for example, may be legislative proposals concerning two or more departments. A comprehensive understanding, gained through discussion of the effect that the proposed legislation may have upon all the State's health programs, may lead to concerted action. This is in contrast to a multiplicity of conflicting approaches which

might otherwise result when departments make individual studies and take separate actions.

Obviously a pattern for interdepartmental cooperation among State agencies must be designed to meet the needs of a particular State, depending upon its laws, traditions, and resources. Several States have developed interdepartmental planning committees, of short or long duration, to tackle specific problems. Others have informal mechanisms for general exchange of information among departments. However, New York State's formal agency, with its own staff to work for regular interdepartmental cooperation and joint planning, would seem worthy of trial in other States.

The same would appear to be true of large cities or regional areas. In 1952, New York City, upon authority of the mayor's order, established an interdepartmental health council patterned after the State council then in existence and consisting of the city commissioners of health, welfare, and hospitals. The executive director of the community mental health services program has since been added. The council meets monthly; its steering committee of deputies meets weekly. While lacking a full-time staff (only a secretary for its subcommittee on aging and the secretary's stenographic aides are full-time), and being more limited in membership than the new State agency, the council has been very effective in bringing about coordinated planning and joint action.

Yet the general development of interdepartmental cooperation has been very limited at both State and local levels. In a 1956 study of cooperation between departments of health and welfare, for example, Muller and Bierman found relatively little growth during the preceeding 5 years (*2*).

In commenting upon the problem of rehabilitation during his recent legislative message, Governor Averell Harriman made the following statement, which seems pertinent here (*3*):

"No phase of our total work in the conservation of human resources, as well as in combating the problem of low income, is more promising or exciting than the work of rehabilitation. Under the general coordination of the Interdepartmental Health Resources Board, created upon my recommendation 2 years ago, we have achieved a teamwork and cooperation among the various agencies concerned superior to anything that was possible before."

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(*3*) New York State Governor, 1954—(Harriman): Message to the New York State Legislature. Albany, Jan. 8, 1958.

Health Law Center

The University of Pittsburgh has established a health law center within the Graduate School of Public Health. The law center will study the legal aspects of medicine, dentistry, nursing, public health, hospitals, and medical care. It will also be a clearinghouse for legislative and other legal materials in the health fields. In effect, the newly created health law center will be continuing and expanding services initiated under a grant from the National Institutes of Health, Public Health Service, which in 1956 provided funds for research into hospital law. Results of that study will be published in a 2-volume manual on hospital law for hospital administrators and attorneys.

Guidelines for the Health Administrator

JAMES R. SHAW, M.D.

The following is, in essence, the text of a memorandum written by Dr. Shaw, who is chief of the Division of Indian Health, Public Health Service, on the subject of basic considerations in health administration. Although the piece was composed specifically to guide new medical officers in charge of Indian health installations, health administrators in all fields may find that its philosophy strikes a resonant chord for them.

THE SUCCESS of any health operation depends in large measure upon the first impression it registers with the patient and his family on their initial contact with its employees. These first impressions set the pattern for future interpretations; they determine the lasting concepts of the operation formed by individual patients and the public generally. Hospitals and clinics take on personalities that are just as distinctive as those of any physician, nurse, or other staff member. The hospital personality, however, is the product of all of the personal traits of those who make up its human element.

Patients and visitors—adult or child, literate or unlettered, of the dominant culture or of a minority group—inevitably sense the underlying attitudes and motives which give the hospital its personality. This consciousness does not require that they understand the professional terms, techniques, and procedures used in their behalf—or even that they understand simple English. But they feel and respond to a general spirit of warmth and sympathy, of understanding and support, when this is offered as the foundation of assistance.

A physician always will need assistance in the performance of his duties; around these duties all of the other activities of the hospital, clinic, office, or field program revolve to lend support. The physician must realize that his success does not depend entirely upon his own actions and ability. His success also depends in part upon the actions and abilities of others, and upon impressions made on the patient by these other individuals. The physician must never forget that he alone is responsible for the end result. Consequently, it is of the greatest importance that he be the true leader of the health team and that he accept responsibility for the personality of the health operation in the eyes of his patient, the patient's family, and the community. The public attitudes toward the operation—good or bad— will develop continuously on a progressively broader base in the direction determined by this concept of personality.

Not by Bread Alone

All of us have certain basic needs that must be met if we are to do a good job and maintain high morale. This is true of all of us—physicians, firemen, nurses, ambulance drivers, and others—and it is true regardless of remuneration received. While dissatisfaction with pay sometimes is the apparent cause of an employee's discontent and desire to change jobs, a good administrator will look first for a more probable "real" cause before considering the subject of remuneration.

Every employee must feel that the program in which he is participating is intrinsically worthwhile and that he is making a valuable contribution. Moreover, he must feel that his contribution will be recognized and appreciated. Each employee must feel that he is not at a dead end, and that progress or growth related to his work is possible within the limits of his desire and ability.

An employee has the right to expect to be consulted on matters pertaining to himself or to his position. He is entitled to reasonable leeway in adjusting to his position and responsibilities in his own way. Such a policy builds confidence and encourages initiative and acceptance of responsibility. The administrator's job satisfaction comes from the success of all, welded into a coordinated, aggressive, successful organization which shows evidence of growth from within.

Ars Medicinalis

The science of medicine continues to expand and become more exact with each passing day. However, there still exists an undiminished need for the practice of medicine as an art. In fact, the success of the scientific procedures may very well depend upon the successful practice of the art of medicine. There always will be broad vistas in the general field of medicine which have not been, and perhaps never will be, filled in by the scientific approach alone.

The practice of medicine as an art is essential because of the basic needs of patients over and beyond their requirements for the application of therapeutic agents and scientific procedures. A patient goes to a physician, or is brought to a medical facility, to get help. His need may lie in conditions which range all the way from acute illness or trauma threatening early death to a state involving no organic disease but requiring psychic support. Whatever the patient's condition may be, he and his family are seeking the physician's assistance in the solution of a problem which is of grave importance to them. Regardless of the exact nature of his problem, the patient can reasonably expect a warm, friendly, relaxed atmosphere and sympathetic understanding. He has, or he hopes to have, confidence in the advice given him so that he can make the decisions necessary for the solution of his problem.

The patient and his family expect to be consulted on all matters of importance so that they can make the necessary decisions—or at least participate in the decision making—after they have an acceptable understanding of the facts upon which the decisions must be based. The patient and his family can reasonably expect stability and maturity on the part of the physician and his prompt attention as the circumstances warrant. They are entitled by law to the preservation of the confidentiality of personal medical information which becomes known to the physician or health facility, and they are entitled to the respect for their human dignity which is the right of all individuals in our society.

These considerations assume added importance when we remember that in acute and catastrophic illness or injury there may be some degree of self-accusation or guilt on the part of the patient, his family, or others concerned. This is particularly true when life and death hang in the balance. It may be manifested by complaints, acts of aggression, or just plain hostility. Such attitudes need never occur, or only rarely, if the basic needs of the patient and his family are met adequately in the practice of medicine as an art as well as a science.

Administration by Group

Administering a health facility or program is primarily a matter of conducting the routine activities in a way that meets the basic needs of patients, their families, and the employees.

The group method of administration is most effective in meeting these needs satisfactorily. In essence, the method permits broad participation in considerations and decisions and delegation of responsibility with commensurate authority. If the method is properly used, if the administrator makes really effective use of the potential and immediately available talent at his disposal, the administration will be sound even though the administrator himself has not had formal training or wide experience in administration. Of course, the administrator must possess personal stability and maturity and must be able to make a firm decision after an objective evaluation of recommendations from his staff and others directly concerned.

We occasionally encounter an operation that is achieving creditable results as a "one-man show." However, this requires exceptional capabilities on the part of the man who is administering it. Most men who have such capa-

bilities are sufficiently experienced to recognize that unilateral administration fails in at least two important respects. It does not provide for professional development of employees—the growth from within which insures the "organization in depth" essential for continuity in operations. It does not contribute to high employee morale, without which the operation cannot continue for long to achieve good results. Eventually, every one-man operation strikes a ceiling beyond which it cannot function satisfactorily.

Group administration requires mutual understanding of the problems, uniform direction of the program, and establishment of a common goal. Each member of the group must think not only in terms of his own specific functions but as well in terms of the relationship of his actions to common efforts to achieve the goal. Without this unity of purpose throughout the organization, its efforts will suffer.

This common approach toward clearly identified goals can be achieved with the help of frequent short meetings where frank discussion and exchange of ideas are encouraged. Such meetings, of course, should be limited to specific considerations. Subjects can be sufficiently broad to include problems of overall administration. In such meetings the administrator must direct the discussion toward the common objective, and he must draw from the participants their ideas relating to broader aspects of the program as well as to their own functions. Through this process the problems which sometimes arise in connection with jurisdictional lines will be minimized, mutual understanding will be fostered, and mutually supporting efforts will result. Many administrative problems will yield to the pooling of ideas and opinions, and others will be placed in proper perspective for further study. But equally as important, the members of the group participating will develop a real sense of teamwork. With firsthand information and broader understanding of program objectives, they will be able to make better decisions in the conduct of their own work.

This is the technique of sound health administration. It requires only a mature, understanding, and secure individual to put the process in operation.

The Good Health Administrator

A good health administrator is qualified in his profession, meticulous in his adherence to ethical practices, and possessed of high ideals and integrity. He is mature in judgment, emotionally secure, warmly human, and—in the eyes of his subordinates—understanding and helpful. The good administrator is a true leader, one who can encourage and inspire his subordinates. He makes friends readily, and he is unfailingly loyal to those who serve under him as well as to his superiors. He recognizes good work promptly, gives credit where it is due, and criticizes constructively and in private. He is both fair and firm, and he is willing to back up those who assist him in meeting program objectives. A good listener, he is able to gather all the facts upon which to act, and to act decisively and promptly without jumping to unwarranted conclusions. He has the ability to seek out the strong points in those who work under him, to cultivate these talents, and to create an environment that insures growth of his organization from within.

The good administrator never forgets that the conduct of his program is his responsibility and his alone. He recognizes that his subordinates to whom he delegates functions are helping him in carrying out his responsibility, and he earnestly appreciates their efforts. Routinely, the good administrator personally visits more or less regularly all of the areas and activities for which he is responsible. In this way he is closer to the problems, frustrations, accomplishments, and capabilities of his people. He establishes and maintains a clear-cut chain of command with properly delegated responsibility and authority. He insures that channels of communication are adequate, that they run up as well as down, and that they are adapted to the needs of the program. He establishes and maintains a fair procedure for dealing with grievances; he sees to it that this procedure is known; and he encourages its use in the interests of the employees.

This is the profile of a good administrator. The exact techniques and the specific approach will vary with the personality of the individual to whom leadership is entrusted. The principles, however, remain constant in all situations and in operations of all dimensions.

Signs and Symptoms

Desalting Water

Coalinga (population 6,000), Calif., will be the first community in the United States to obtain its entire supply of drinking water through electronic desalting of brackish water.

An $80,000 apparatus will produce 28,000 gallons of drinking water daily at a cost of about $1 per 1,000 gallons after the unit is paid for.

Coalinga has been carrying drinking water by railroad from Armona, 45 miles away, at a cost of about $7 per 1,000 gallons. The city's well water contains approximately 2,000 ppm of salt.

Voluntary Admissions

A new provision in New York State's mental hygiene law reduces from 60 days to 15 days the maximum time a voluntary patient may be detained in a State hospital at the discretion of the director. It also reduces from 15 days to 10 days the time a voluntary patient may be detained after he has given written notice of his intention to leave.

Operation Cleanup

Sanitary conditions in Laredo, Tex., have been improved as the result of a 4-stage vector control project. To reduce the large rat population and vast numbers of flies and mosquitoes at peak season, the city attacked the breeding and feeding grounds (refuse dumps, privies, ill-kept garbage cans, and open, flat trucks used for refuse removal) as well as the vectors directly.

In cooperation with the city of Laredo, the Texas State Department of Health and the Public Health Service began the project in 1954 with surveys of unsavory spots, sewage facilities, and waste disposal practices. Ten covered trucks were purchased to carry refuse to the new controlled sanitary landfills. Galvanized garbage cans, placed on elevated racks, were bought by 10,000 families in 1 month.

Since most of the privies were near sewer lines, nine different plans were applied to help small homeowners without funds to install modern plumbing. The city also began extending its sewer lines.

Warfarin reduced the proportion of rat-infested premises from 75 to 5 percent, with a consequent disappearance of typhus fever. Sprays cut down flies and mosquitoes, with a consequent drop in the incidence of diarrheal diseases. Insecticides and rodenticides, however, are only used as a supplement to the main work of eliminating breeding potentials.

The project continues with plans to create parks and playgrounds over landfilled areas.

X-rays Discontinued

The Christmas Seal mobile X-ray unit of the Buffalo and Erie County Tuberculosis Association was officially discontinued in July 1958. When special circumstances warrant, services for select groups will be arranged by the association with the Erie County and New York State Health Departments' X-ray units.

Appointments

The American Public Health Association has announced five new appointments: Dr. Thomas Hood, associate executive director; Dr. James L. Troupin, assistant director assigned to the association's committee on professional education; Noble Swearingen, director of Washington, D. C., office; Robert Mytinger, director of western regional office, San Francisco; and Dr. Edward Wellin, who will study the relation between public health and the behavioral sciences.

Indian Self-Help

Indians are helping themselves to health. Ute tribal council financed $100,000 water system to serve 100 homes in Towaoc, Colo. Navajo tribal council budgeted $206,750 for 1959 for equipment in health facilities, emergency care for students, prosthetic appliances, hearing aids, and glasses. Navajos also offer free layettes for babies born in hospitals or brought to hospitals for examination in their first month.

Immunization

A complete immunization program, reported as a "first" in the State, has been set up for all patients and employees in Pennsylvania's State institutions.

Patients and employees will be immunized against smallpox, diphtheria, tetanus, typhoid, influenza, poliomyelitis, and tuberculosis.

Sanitarians in the Butte County Health Department, Calif., have inspected the operational safety of X-ray units of 59 physicians, veterinarians, and dentists at their request.

A health education show last August, the first to be held in New York City's Coliseum, attracted 40,000 visitors.

Burning discarded automobiles and parts in the open air has been banned in New York City. It is estimated that 200,000 cars had been burned annually in the city by automobile wreckers. Incinerators now on the market will take over the job.

Recent developments in drugs and medicines, changes in the size of manpower engaged in their production and compounding, changes in the nature of products, materials, and dosage forms, cost and price developments, and changes in the dollar volume of prescription pharmaceuticals are reviewed.

Drugs and Medicines

LUCY M. KRAMER

OVER the past few decades, new drugs and medicines have contributed importantly to progress in public health. "Miracle" drugs have lowered national death rates and sharply reduced acute communicable diseases.

Since the introduction of sulfa drugs in 1937, deaths from influenza-pneumonia have decreased 75 percent, from 114.9 per 100,000 in 1937 to 27.1 per 100,000 in 1955 (*1*). The principal diseases of childhood—scarlet fever, streptococcal sore throat, diphtheria, whooping cough, measles—which caused 10 deaths per 100,000 children in 1945, in the space of only 10 years dropped to 1 death per 100,000, a decrease of 90 percent (*2*). According to unpublished data of the National Office of Vital Statistics, the mortality from all infectious diseases dropped in 50 years from 676.2 per 100,000 in 1900 to 44.3 per 100,000 in 1956.

Drugs and medicines have transformed both the practice of medicine and the patients' use of health services. The drug industry responsible for the development, production, and distribution of these products has helped to support medical research in its own laboratories and in the medical schools, universities, and teaching hospitals of the country. The industry is presently participating in the extensive cancer chemotherapy studies of the National Institutes of Health, Public Health Service. Drug firms and community pharmacists also have assisted in the health education programs of health departments and voluntary health agencies.

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Pharmaceutical Manpower

About 2 million persons are employed in health occupations. About 111,000 of these are registered pharmacists (*3*). In addition to those directly employed in the provision of health services, nearly 200,000 are engaged in supplying goods and services essential to health occupations (*4*). According to the 1954 Census of Manufactures, these persons were engaged in affiliated industries such as the production of scientific and professional instruments and supplies (including medical, surgical, dental, and optical); biological, medicinal, chemical, and pharmaceutical preparations; ophthalmic goods; X-ray and therapeutic apparatus. Of these, the largest number—some 92,000—were engaged in the manufacture of drugs and medicines. In addition to skilled operatives, clerical, and other employees, the drug firms reported 380 physicians in their employ as of January 1957 as compared with 155 ten years before and 65 twenty years earlier. The total number of employees with graduate degrees in the medical and allied sciences was 3,000 as of January 1957 compared

with 990 ten years before and 300 twenty years earlier (*5*).

The number engaged directly in health occupations or in affiliated industries is approximately double the 1.1 million estimate of 1929, the latest year of high-level employment in the pre-antibiotic era (*6*).

The number of pharmacists, however, has not grown correspondingly. Wholly comparable figures for the several decades are not available. Rorem and Fischelis reported for 1931 some 115,000 registered full-time pharmacists in the United States, and a total of about 130,000 individuals legally recognized to practice pharmacy either as fully registered pharmacists or as auxiliary assistants (after making a correction for the many duplicate registrations, that is, registrations issued to the same individual by several States) (*7a*). In 1955 some 158,775 registrations were held by pharmacists in good standing (many of them duplicates), of which 110,992 were held by pharmacists engaged in active practice in the various States (*8a*). By the end of 1956, the number of such registrations had increased to 162,459 (*9a*), but the number held by pharmacists engaged in active practice had decreased slightly to 110,688 (*9b*). It appears that the number of active pharmacists has not changed materially since 1931.

For the Nation as a whole, in 1955 there were 67 practicing pharmacists per 100,000 population, about half the physician-population ratio. About 89 percent of the pharmacists were engaged in retail pharmacies, 4 percent in hospital pharmacies, 6 percent in manufacturing or wholesale establishments or as representatives of the establishments, and 1 percent in teaching or government positions (*8b*). Today, about 10 percent of new graduates are going into hospital pharmacy work, and more than 5 percent of the total working pharmacist population is currently so employed (*10a*). Thirty-eight percent of the pharmacists employed in hospitals and 6 percent in the profession as a whole are women (*10b*).

The Census of Pharmacy reports that there were 52,779 retail pharmacies at the end of 1955 and 1,176 hospital pharmacies dispensing drugs and medicines. In addition 37,515 dealers other than pharmacists were licensed in the various States to sell packaged drugs (*8c*). The number of retail pharmacies has declined absolutely since 1929 (from approximately 60,000 to about 53,000 in 1955), and in proportion to population (*7b*, *8c*). In the 40 years prior to 1929, the population per drug store declined somewhat. In 1890 the population per drug store was 1,838 and in 1895 it was 1,745. By 1903 the ratio had increased to 2,030 persons per drug store, where it remained almost constant for more than 25 years. Since 1929 the population-drug store ratio has increased from 2,020 (*7c*) to 3,126 in 1955 (*8c*), that is, there are fewer drug stores for more people (with a trend toward larger prescription departments and less general drug store merchandising).

In contrast the drug manufacturing industry has expanded markedly since 1929 in number of employees. Almost four times as many employees were engaged in the manufacture of drugs and medicines in 1954 (*11*) as were employed in 1929 (*7d*).

Products and Materials

The drug industry since the advent of sulfa drugs in 1937 has been characterized by rapid change. The rate of change has been so accelerated that progress in the last 30 years may well have exceeded that of several centuries before.

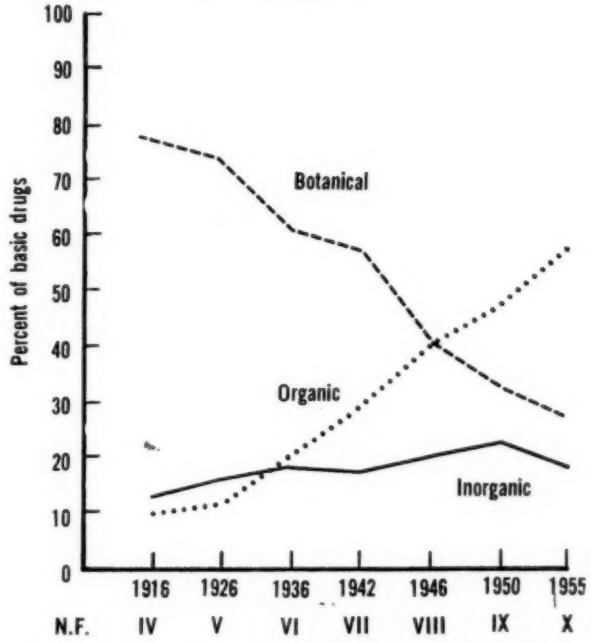
A recent analysis of the basic drugs listed in the National Formulary between 1916 and 1955 reflects the sharp change in the relative importance of basic materials in the drug industry (*12a*).

In 1916, almost 80 percent of the basic drugs were of botanical origin, 10 percent of organic chemical origin, and 10 percent of inorganic chemical origin. In 1955, the use of botanicals had dropped to 30 percent, organic chemicals had risen to 50 percent, and inorganic chemicals to 20 percent (fig. 1).

Botanical sources have been replaced by organic chemical sources that are more easily available, more concentrated, more easily controlled in their manufacture, and more specifically effective.

Changes in the principal categories of drugs listed in the 1950 and 1955 United States

Figure 1. Trend in National Formulary basic drugs, 1916–55.



SOURCE: Reference 12a. Based on Journal of the American Pharmaceutical Association (Practical Pharmacy Edition) 16: 424–425, July 1955.

Pharmacopeias as shown in table 1 also reflect the tremendous increase in certain types of drugs during a 5-year period. The fifteenth U. S. P., released in August 1955, lists almost 250 new drugs that have been officially accepted for inclusion after stringent review (*12a*). The new U. S. P., scheduled for publication in 1960, will have an even larger number of new drugs.

Since 1948, more than 3,000 new prescription drug items have entered the market, each with an average life span of 2 to 5 years, and the forecast for new drugs looks even busier (*13*). In 1940, less than 100 new specialties were introduced (*14*). In 1957 alone there were 400 new pharmaceutical products put on the market, some of which were entirely new chemical entities; others, new combinations or new dosage forms of less recently new drugs (*15*, *16a*). It has been said that a majority of the prescriptions written today could not have been filled 20 years ago since many of the drugs now used were unknown. Sulfa drugs were introduced in 1937; penicillin in 1940; streptomycin in 1946; antihistamines in 1947; cortisone, ACTH, and hydrocortisone in 1950 and 1951; chlortetracycline U. S. P. (Aureomycin), chloramphenicol U. S. P. (Chloromycetin), and oxytetracycline U. S. P. (Terramycin) in 1950; rauwolfia and certain types of psychopharmacologic agents (for example, meprobamate) in 1953.

In dollar value of total prescriptions filled, antibiotics today account for about 25 percent of total volume (*16a*). Antibiotics also represent about 25 percent of drug purchases in Public Health Service hospitals (*17*). (An economic study by the Federal Trade Commission of the entire antibiotic industry, covering prices in particular, but also including patents, manufacturing processes, and other aspects, was recently published, and should throw needed light on this extensively used drug category.)

About 7 cents of every dollar spent for drugs in Public Health Service hospitals in fiscal 1957 was for psychopharmacologic medications (tranquilizers) (*17*). The proportion is expected to go higher in 1958. Expenditures and use with respect to tranquilizers by the general population parallels Public Health Service experience.

The future of the drug industry is now based on constantly developing new products. A president of one of the leading drug firms has stated "the pharmaceutical industry lives in the shadow of its own obsolescence" (*16b*).

With the intensified current basic research

Table 1. Changes in principal categories of drugs included in United States Pharmacopeia

Drug categories	U. S. P. XIV (1950)	U. S. P. XV (1955)	Percent increase
	Number of categories		
Antihistamines	2	13	550
Antibiotics	5	12	140
Diagnostic aids	9	16	78
Endocrine preparations	18	25	38
Analgesics and sedatives	18	21	17
Biologicals	29	34	17
Chemotherapeutic agents	27	31	15
Vitamins	13	15	15

SOURCE: Reference 12a. Based on Journal of the American Pharmaceutical Association (Practical Pharmacy Edition) 16: 424–425, July 1955.

in mental illness, coronary diseases, cancer, and chronic problems of old age, a poll of leading drug company executives indicates that they expect drugs affecting these types of illnesses to be important in the next 5 or 10 years (*16b*).

Highlighting the anticipated drug needs of the future are the following (*18*):

1. Drugs which will permit therapeutic approaches to a variety of mental illnesses and personality problems.
2. New chemical and antibiotic treatments to arrest certain forms of cancer.
3. New treatments for the prevention and cure of hypertension and other circulatory ills.
4. New developments to control degenerative diseases.
5. New discoveries for the better management of nutrition.
6. New products to subjugate a number of the still resistant viral diseases.

Pharmacist and New Products

One consequence of the newer drugs and the growth of the medical materials industry has been a change in the function of the pharmacist. Writing in 1929, Fischelis emphasized that the "development of machine production of pharmaceuticals has left its mark on the retail pharmacies in that it has reduced the function of the apothecary in many cases to that of dispensing prepared medicines" (*19*). The products developed in the subsequent years have accelerated the trend observed by Dr. Fischelis 30 years ago.

The pharmacist is no longer primarily the compounder of powders, ointments, and potions, but the dispenser of prefabricated medicines on prescription. More than 80 percent of all prescriptions sold at present are dispensed rather than compounded (*13*).

Another consequence has been a sharp increase in prescription practice of the drug store. Prescription volume increased from an average of less than 10 percent of total drug store sales some 30 years ago (*7e, 20*) to about 30 percent at the present time (*21a, b*). The average prescription price has increased during that period almost as rapidly as the volume (table 2). Total drug sales, including prescription accessories and packaged medicines,

Table 2. Ratio of prescription volume to total drug store sales and average prescription prices for selected years, 1929, 1931, 1941, 1946–56

Year [1]	Ratio of prescription volume to total sales (percent)	Average prescription price
1929	8.5	$0.85
1931	8.1	.92
1941	13.2	.93
1946	15.8	1.33
1947	16.6	1.41
1948	18.8	1.51
1949	19.0	1.60
1950	20.4	1.77
1951	21.8	1.90
1952	23.7	2.08
1953	24.2	2.19
1954	24.9	2.27
1955	27.3	2.46
1956	29.5	2.62

[1] SOURCE: For 1929, reference 7e; for 1931, reference 20; and for 1941, reference 21a,b.

account for about 50 percent of drug store sales (*16c*).

Total drug store sales in 1929 amounted to $1,650 million (*7b*); in 1956 these sales had risen 358 percent to $5,912 million (*16a*). During the same period prescription volume grew from about $140 million (*7e*) to $1,466 million (*16a*), an increase of more than 1,000 percent, almost three times as fast as total drug store sales. Rorem and Fischelis have observed that the index of drug sales volume does not parallel disease incidence, but tends to reflect the level of expendable consumer income (*7f*).

A third consequence is the increase in the share of drug sales to hospitals. Of an estimated expenditure of $190 million in 1929 for prescription drugs, hospitals and dispensaries purchased $25 million, or less than 13 percent; drug stores bought $140 million, or 74 percent; and physicians accounted for the remaining $25 million (*7g*). A recent survey shows that about 24 percent of prescription drugs now goes to hospitals, 56 percent to drug stores, and 20 percent to physicians (*12b*).

A fourth consequence has been the rise in importance to doctor, pharmacist, and hospital of the "detailman." As a professional service representative in the pharmaceutical

and chemical industry, he is required to have scientific knowledge and the ability to impart and use it effectively in selling prescription drug products (*22*). He often is a pharmacist, sometimes a medical student or graduate, always a well-informed individual. His duties are to visit physicians, dentists, veterinarians, wholesale and retail druggists, hospitals, clinics, and dispensaries, exporters, and all other possible purchasers of his company's pharmaceutical preparations. He is the means by which the results of research and development become directly known and used. Although exact figures on the number of such "detailmen" currently in the labor force is not available, the number of registered pharmacists alone representing manufacturers and wholesalers of drugs increased from 2,415 in 1955 to 2,739 in 1956 (*8b*, *9c*).

Dosage and Dosage Forms

The Bureau of Labor Statistics has for many years included in its medical care component of the Consumers Price Index a breakdown of drug items used in selected prescriptions with the content and dosage form carefully specified. A typical prescription unit for pricing is specified as a "capsule" prepared by a compounding pharmacist.

The pharmacist-compounded capsule era, together with the era of powders and potions in medication is ending, however. By 1955, tablets produced by a pharmaceutical house in wholesale quantities represented the typical dosage form; parenterals and liquids held second place. Together they accounted for about 75 percent of the new drug dosage (*12a*).

Analysis of the 20 largest volume prescription items currently being dispensed in a Public Health Service outpatient pharmacy shows that 13 of the 20, or 65 percent, are dispensed in tablet form.

Aspirin, which leads all other drugs in volume of output—16½ million pounds in 1956, an increase of 159 percent in the last 16 years—is one of the tablets that has become standardized in content, shape, and size.

Not only has the tablet become the typical dosage form, but the efficacy per tablet is constantly being increased. A penicillin tablet with a built-in delayed action mechanism has been developed which would require only one tablet per day for 24-hour medication. Other tablets (and some capsules and granules) have been developed and marketed recently which contain in one medication several different drugs in various doses that are released into the system at various times.

The traditional injection of insulin may someday be replaced by a tablet, and has already been in certain cases. A sulfa drug, tolbutamide (Orinase), has been used in about 250,000 cases of diabetes, most of them mild, and on patients over 20 years old. Its efficacy depends on prodding the pancreas into doing its own work. Oral medications are less traumatic than hypodermic injections, are considerably less dangerous and troublesome, and require no sterilization (*23*).

The controllable techniques involved in the production and distribution of tablets, the standardization of size, shape, and color, the stability of the product, the general public acceptance of tablets as a form of medication, and the ease with which dosages can be taken, all contribute to the increasing manufacture and use of tablets as dosage forms.

Cost and Price Trends

Medications have become more complex, more effective, and more expensive. Writing about 1929, Rorem and Fischelis stated: "The amounts spent by individuals or families for drugs and medicines during a given period do not show a wide variation, and seldom, if ever, amount to totals which are catastrophic in their effects" (*7h*). Individual prescriptions, however, are now far more costly and families may incur sizable drug expenses especially in cases of prolonged or chronic illness. Children for whom maintenance dosages of antihistamines and other drugs are prescribed, for example, may have long-term drug bills of $15 or more a month, without any allowance for cost of additional dosages required during acute stages of illness. Older people with cardiac, hypertensive, or arthritic conditions may have maintenance medications prescribed for them which total $25 or more a month. In the 1952–53 study of family medical expense it

was found that 2 percent of the families incurred charges for medicines in excess of $195 per year (*24*).

Average family or per capita expenditures for drugs, however, have increased somewhat less than disposable income, that is, family income after taxes. In 1956, $1,885 million was spent by the Nation's families for drugs, medical supplies, and sundries, exclusive of drugs and dressings used in hospitals or dispensed by physicians. This represents an annual outlay of 0.66 percent of disposable income, or $35.70 per family and $11.41 per person. In 1929 personal spending for drugs, medical supplies, and sundries amounted to $604 million, or 0.73 percent, of disposable income, an expenditure of $16.73 per family and $4.96 per person (table 3). During that time disposable personal income increased from $83.1 billion to $287.2 billion, an increase of 346 percent; personal spending for drugs, medical supplies, and sundries increased only 312 percent (*25a, b, c*).

Personal expenditures for drugs, medical supplies, and sundries have increased since 1929 less than medical care generally and less than many items within the medical care component. In part this may reflect higher real incomes of the Nation's families, improved health education, increased use of physician services, and the relative growth of prescribed as compared with nonprescribed drugs. In part this may reflect the expanded use of hospital care and the relative increase in costs of various services included in hospital care. As a consequence (fig. 2), drugs, medical supplies, and sundries as a personal expenditure represented a smaller part of the personal medical care dollar in 1956 than even 10 years earlier in 1946, or than in 1939 and 1929 (*25a, b, c*).

Drug costs as a part of hospital costs, however, have risen significantly more than other components of the hospital dollar. The Commission on Financing Hospital Care found that drugs as a percent of hospital costs between 1942 and 1952 had increased more than 300 percent (table 4), a greater increase than any other of the services analyzed (*26*).

Personal or hospital drug expenditures reflect changes in volume of use of medications, types of drugs used, and price per unit.

There are also data which show only the changes in price per unit, without reflecting volume of prescriptions. Two basic types of price series are available as measures of retail price changes.

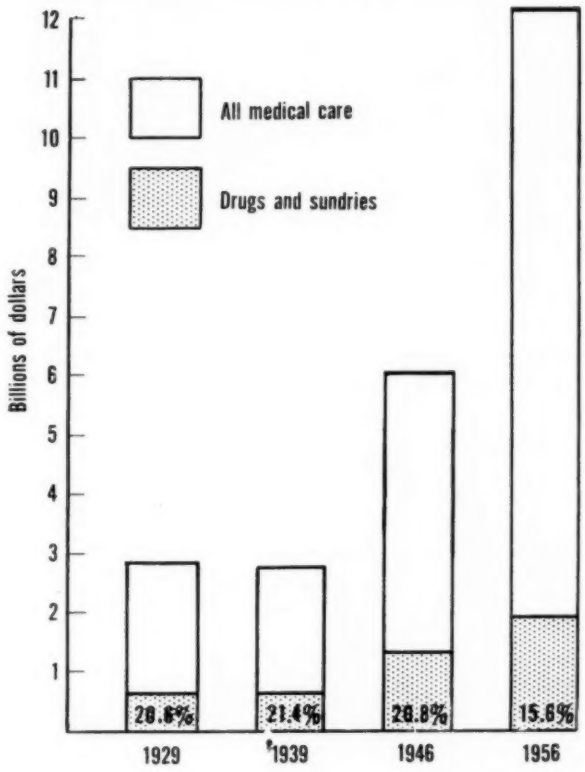
The first type is the often-quoted price series compiled by the Bureau of Labor Statistics. According to the Bureau of Labor Statistics Consumer Price Index, a measure of change in the price of specified items customarily purchased by urban wage-earner and clerical-worker families (*27*), the price index of all items rose 96 percent between 1936 and 1956

Table 3. Disposable personal income, personal spending for medical care, and for drugs and sundries (per capita and per family) for selected years, 1929, 1931, 1939, 1941, 1946, 1951–56

Year	Disposable personal income (millions) [1]	Personal medical care expenditures (millions)	Personal expenditures for drugs and sundries				
			Total (millions)	Percent disposable personal income	Percent medical care	Per capita	Per family
1929	$83,120	[2] $2,937	[2] $604	0.73	20.6	$4.96	$16.73
1931	63,840	[2] 2,549	[2] 517	.81	20.3	4.17	14.05
1939	70,444	[2] 2,848	[2] 612	.87	21.5	4.94	14.96
1941	92,982	[2] 3,298	[2] 725	.78	22.0	5.51	17.52
1946	159,182	[2] 6,104	[2] 1,271	.80	20.8	9.18	29.33
1951	226,069	[2] 8,780	[2] 1,516	.67	17.3	10.03	30.64
1952	237,374	[3] 9,397	[3] 1,569	.66	16.7	10.23	31.25
1953	250,235	[3] 10,107	[3] 1,615	.65	16.0	10.35	31.97
1954	254,463	[3] 10,603	[3] 1,631	.64	15.4	10.25	31.89
1955	270,189	[3] 11,273	[3] 1,747	.65	15.5	10.76	33.49
1956	287,202	[3] 12,106	[3] 1,885	.66	15.6	11.41	35.70

SOURCES: [1] Reference 25a. [2] Reference 25b. [3] Reference 25c.

Figure 2. Personal expenditures for drugs and sundries and all medical care for selected years, 1929, 1939, 1946, 1956.



(from 59.3 to 116.2); the medical care index (all items) rose 85 percent (from 71.6 to 132.6); and prescriptions, drugs, and medical supplies rose only 37 percent (from 82.8 to 113.7). Prescriptions, drugs, and supplies make up about 17 percent of all medical care, and medical care about 5.4 percent of all items in the Consumer Price Index.

During the first decade, from 1936 to 1946, the medical care index rose relatively slowly, only one-third above 1936. The rest of its increase, two-thirds, occurred in the second decade, from 1946 to 1956. In the overall 20-year rise, medical care ranked fourth after food, personal care, and apparel.

In the 10-year period from 1946 to 1956, the total medical care index increased to 132.6 as compared with 116.2 for all items (1947–49=100). Within the medical care category are included doctors', surgeons', and dentists' fees, optometric examinations and eyeglasses, hospital room rates, group hospitalization, prescriptions and drugs. Hospital room rates showed the largest increase, rising to 173.3. Prescriptions and drugs, combined, increased to 113.7. Prescriptions, alone, increased to 121.0, largely as a result of the new drugs. Figure 3 shows the relative increases in total medical care index in the last 10 years, and in prescriptions and drugs particularly. The index of aspirin prices was 125 in 1929 (1947–49=100), fell steadily to 97.6 in 1941, rose to about 100 in 1948, and has remained at more or less the same level since.

The second type of price series represents average prescription prices. Whereas the Bureau of Labor Statistics drug price series measures changes in price for a specified "basket of drug items" selected as of a given period, the average prescription price series reflects changes in the drug item purchased.

The average prescription prices increased from about $0.85 in 1929 to $2.62 in 1956, a more than threefold increase (table 2). Average prescription prices in 1956 varied from $2.49 to $2.79, according to different surveys. A recent figure for 1957 gives $2.93 as the average prescription price, the highest on record (*16a*).

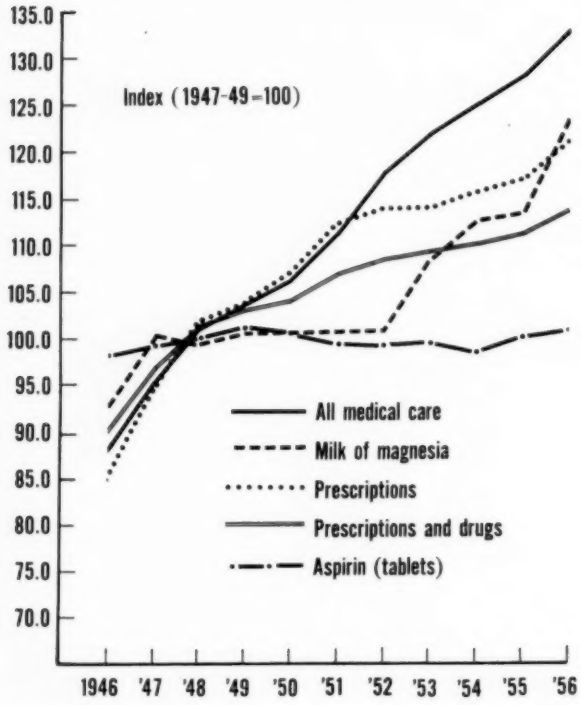
The average price per unit of many of the newer drug types is more than $3 per prescription. For about 8 of the 26 drug classifications used by the *American Druggist* in its annual prescription survey—classifications accounting for about 54 percent of prescriptions sales in 1956—the average price per prescription was over $3. In 1957, the figures are even

Table 4. Average amount billed to semiprivate nonmaternity patients utilizing specified hospital services, 1942 and 1952

Service	Average amount billed		Percent increase
	1942	1952	1942–52
Operating room	$10.14	$23.81	135
Anesthesia	6.97	15.79	127
Electrocardiogram	8.56	14.08	64
Basal metabolism	6.76	9.87	46
Drugs and dressings	7.66	31.63	313
X-ray	15.97	20.66	29
Laboratory	5.97	'8.02	202
Physical therapy	12.98	24.20	86
Oxygen therapy	13.52	38.59	185

SOURCE: Reference 26.

Figure 3. Consumer price indexes for medical care items, annual averages.



more revealing. Table 5 shows that 8 of the 26 classifications accounted for 60 percent of the dollar value of prescriptions; all averaged more than $3 per prescription, and two more than $4 (*16a, d*).

Prices of new drugs follow a characteristic pattern of decline after initial introduction, and when volume use and production take place. Penicillin in 1943 sold for $20 per 100,000 units in injectable form. In 1956, it sold for $0.20 per 100,000 units in tablet form, a drop of 99 percent (*28a, 29a*). Since its introduction in 1950, cortisone has dropped 90 percent in price (*15*). Within 2 years of its introduction cortisone fell from $200 per gram when made from animal bile to $50 when made from yams and other plants (*28a*). Streptomycin dropped 40 percent in less than a year (*13*). Insulin now costs about 6 percent of what it did 30 years ago, shortly after it was introduced (*28b*).

The downward movement in prices of new drugs is a brake on the prescription price index. However, this type of price index is also influenced by the distribution of prescriptions among different kinds of drugs, as well as by the rapid obsolescense of drug items and their continuous replacement by newer, more effective, and, at original issue, more expensive drugs.

Drug and Illness Costs

The cost of medicines may also be viewed as a part of the cost of illness. As indicated earlier the percent of the personal medical dollar going to drugs, medical supplies, and sundries has declined. In terms of specific illnesses drug costs have risen sharply but have been instrumental in reducing the total medical outlays and in shortening hospital stays and time loss from productive activity.

According to one source, 20 years ago a case of lobar pneumonia meant 5 weeks in a hospital, long convalescence, and $300 to $400 for doctors, nurses, medicine, oxygen, and hospital care. Today it means 2 weeks of illness, generally at home, back to work immediately thereafter, and $15 to $30 for drugs (*29b*).

Thirty years ago the treatment of mastoiditis cost at least $1,000, required surgery, and involved the possibility of permanent impair-

Table 5. Comparison of selected prescription types by percent of total dollar value of all prescriptions sold, and average price, for 1956 and 1957

Prescription type	Percent of total dollar value		Average price	
	1956	1957	1956	1957
Anti-infectives	24. 1	25. 4	$3. 68	$4. 03
Sedatives	*14. 5*	15. 2	*2. 86*	3. 01
Cardiovasculars	9. 3	*6. 8*	3. 20	*2. 91*
Anti-arthritics	6. 0	5. 4	4. 16	4. 10
Stimulants	3. 9	4. 1	3. 05	3. 23
Hematinics	4. 0	3. 5	3. 62	3. 52
Sex hormones	2. 4	2. 1	3. 15	3. 26
Therapeutic vitamins	2. 3	2. 5	3. 46	3. 31
Preventive vitamins	1. 9	1. 7	3. 14	3. 19
Other types	46. 1	40. 1	------	------
Total	100. 0	100. 0	------	------

SOURCE: References 16a, d.

NOTE: The italicized figures are not included in the totals, for the year involved. Thus the number of specific prescription types listed is 8 in both 1956 and 1957. Sedatives were less than $3 in 1956, hence not included for that year; cardiovasculars were less than $3 in 1957, hence not included for that year.

ment of hearing. Today $15 worth of antibiotics clears up most cases without surgery (*29c*). Syphilis was an important cause of expensive and protracted illness two decades ago. Today, syphilis is often "cured" or at least brought under control with one shot of long-acting penicillin (*14*). In the United States, penicillin has completely supplanted older forms of therapy such as arsenic and bismuth (*30*). New drugs, including isoniazid, have helped to reduce deaths from tuberculosis. Between 1946 and 1955 the tuberculosis death rate dropped from 34.9 per 100,000 to 9.1 per 100,000, a decrease of almost 75 percent (*2*). Many patients are now cured at home in a small fraction of the time, and the cost, it took when prolonged rest in a sanatorium was the major technique.

Volume of Prescription Pharmaceuticals

A recent guide to the sales and status of the drug market warns the reader, "Before using this book, we suggest that you rid yourself of all old conceptions of the magnitude of the volume of manufacturers' sales of ethically promoted pharmaceuticals for human use. Otherwise today's figures will seem fantastic. Times have changed. We sometimes look back with nostalgia to 1929 when the manufacturers' sales amounted to about $250 million. Think now of sales in manufacturers' dollars of nearly $6 for each and every one of 165 million persons in the United States!" (*12c*).

From 1929 to 1955, then, the sales volume of manufactured prescription pharmaceuticals almost quadrupled, from $250 million to $990 million. Current trends show sales to be considerably higher.

In a recent speech before the 61st Annual Conference of Food and Drug Officials of the United States, an official of one of the major drug laboratories said that 10 leading drug houses alone, in their 1956 annual reports, showed sales that ranged from $100 million to $200 million (*31*).

One drug company reports sales in 1957 of $207 million as compared with its 1956 sales of $178 million (*32*). Its 1958 sales for the first quarter were $54 million as compared with $51 million in 1957; its 1958 earnings for the same period were $6½ million, 19 percent above 1957 and a record high (*33*).

The manufacture of prescription pharmaceuticals is now well over a $2 billion industry. The increased volume of wholesale drug sales is of course reflected in the increased retail prescription volume.

An industry publication, in its Silver Anniversary issue, stated: "Drug store sales volume in 1956 was the highest ever recorded" (*21c*). In an 11-year period the number of prescription sales increased by 50 percent and the income from prescriptions tripled, largely because of increase in average prescription prices, but to some extent from an increase in the number of prescriptions dispensed (*21d*). "The 11-year rise in average prescription prices is due to the tremendous increase in the widespread use of new therapeutic agents, virtually all of which are costly to dispense." (*21b*).

Summary

The nature of the drug industry has changed in the last 30 years. With it has changed the manpower in the industry and the pharmacist's role—from a compounder to a dispenser of drugs. The increased number of drugs and their complexities have intensified his services as drug therapy consultant to physicians and dentists. The basic sources and compounding of pharmaceuticals have changed in character, and have increasingly become the object of intensive research by both private and public organizations in the effort to develop specific drugs for specific illnesses. The dosage and dosage forms have become more concentrated and standardized, generally in tablet form. Drugs represent a decreasing proportion of the medical care dollar and of disposable income. The price of drugs generally has been high for new items, falling with volume use and production, or obsolescence. Average price per prescription has doubled since 1946 and more than tripled since 1929. The length of some illnesses has been shortened by the development of specific therapies, and the cost has been cut even though drugs are more expensive. The volume of manufactured prescription pharmaceuticals increased from $250 million in 1929 to more than $2 billion in 1956, a tenfold increase in

less than 30 years. The volume of retail prescriptions has increased during that period, from $140 million to $1,466 million.

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Interstate Shipment of Milk

Ban on out-of-state milk, unless produced and handled under conditions no less adequate in protection of public health than milk produced in State upheld. *James* v. *Todd*, 103 So. 2d 19 (Alabama, Aug. 22, 1957).

A declaratory judgment of the Supreme Court of Alabama has upheld the validity of an Alabama statute (Act No. 570, 1955 Acts) prohibiting the shipment of milk into Alabama from another State "unless such milk is produced and handled under sanitary conditions no less adequate in protection of public health than milk produced in the State of Alabama," and authorizing the State Commissioner of Agriculture and Industries to inspect the conditions under which out-of-state milk was produced and to issue and revoke permits for transportation of such milk into Alabama.

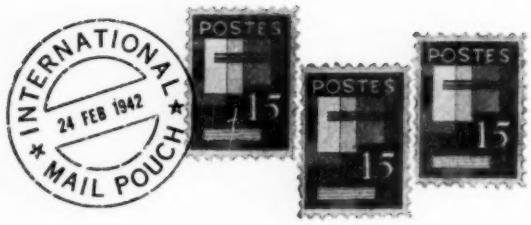
After citing *Milk Control Board of Pennsylvania* v. *Eisenberg Farm Products*, 306 U. S. 346, 59 S. Ct. 528 as evidencing recognition by the Supreme Court of the United States that the milk business is essentially local and, therefore, subject to the police power of the State, the Alabama court stated:

"Under its police power, the State of Alabama is authorized to enact laws designed to protect the health of its citizens and more particularly where milk is concerned because of its nutritional importance to human beings and because of its susceptibility to contamination. . . . The Legislature may even grant to a municipality the power to provide health regulations."

The mere fact that the statute was applicable only to out-of-state milk did not, the court held, constitute an unreasonable discrimination or a burden on interstate commerce. The validity of the statute was, however, held to depend on whether it was a reasonable system established as a safeguard of the public health or a system calculated to prevent the importation of out-of-state milk in competition with local supplies. The court distinguished *Dean Milk Co.* v. *City of Madison*, 340 U. S. 349 (where the appellant was denied a license to sell milk in the city because its plant was more than 5 miles away), and other related cases, on the ground that those cases dealt with the administration or enforcement of statutes which in operation "made it practically impossible to import . . . goods into the State."

While the court conceded that in the administration of the Alabama Act there was a possibility of abuses such as would raise a question of its constitutionality, it concluded that the statute, on its face, was reasonably related to the protection of the public health and was not intended to prevent the importation of out-of-state milk in order to eliminate competition with local supplies.

The court warned, however, that enforcement of the statute under a construction (supportable under the literal language of the act) which would limit permits to shippers of milk, and hence exclude milk from out-of-state producers who were not also shippers, would be unconstitutional.



Public Health Dentistry

The School of Hygiene and Public Health at the University of São Paulo is now training dentists to administer dental public health programs in Latin America. The course of study, leading to a degree equivalent to master of public health, is the first such course in Brazil.

Sixteen dentists, half of them studying under World Health Organization fellowships, enrolled in the course in February 1958. They come from Argentina, Brazil, Colombia, Costa Rica, El Salvador, Paraguay, Peru, and the Dominican Republic.

They study general public health subjects with physicians, veterinarians, and engineers. Separate classes on specific dental subjects include refresher courses in dental techniques, current information and methods in caries prevention, and technical guidance during field work.

Several agencies are cooperating with the university in this course. WHO provides advisory services, fellowships, and teaching materials; the Kellogg Foundation gives financial aid, equipment, and supplies; and Serviço Especial de Saúde Pública participates in the students' field training.

—ALFREDO REIS VIEGAS, D.D.S., M.P.H., *assistant professor, School of Hygiene and Public Health, University of São Paulo, Brazil.*

Typhus Among the Araucanians

In Cautín Province, Chile, where the National Health Service has battled classic louseborne typhus fever for several years, are some 150,000 Araucanian Indians, the people celebrated in Ercilla's epic poem, "La Araucana."

The Araucanians live primitively in *rucas,* or huts, much as they did when they successfully withstood for hundreds of years both Inca and Spanish conquest. Their huts are scattered singly and in three's and four's over a wide area, and they travel long distances on foot, horseback, or by oxcart. But their custom of attending funerals in extraordinarily large numbers has helped to spread typhus, which they carry back to their home areas after these gatherings.

We visited the central Chilean province, which has an endemic focus of typhus, to get first-hand information after the National Health Service asked for help in eradicating the disease. The area where most work is needed is impassable to motor vehicles 9 months of the year, and only jeeps can be used the other 3 months. Nevertheless, we hope to start a combined disinfestation and typhus vaccination campaign the latter part of 1958.

—G. HOWARD GOWEN, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Chile.*

The Mountain People

The way of life of the mountain people in the Philippines makes it difficult for malaria eradication teams to protect them from the disease. Dissident and evasive with lowlanders, the mountaineers are hard to reach. Distribution of a drug-salt mixture is planned.

The mountain people withdraw from the settlements and follow their own customs in remote, high, forested areas. Some grow mountain rice and sweet potatoes on cleared plots which they abandon after a year or two. Others simply gather the food nature provides. Houses may be nonexistent, or tree dwellings, or roofed platforms, or permanent structures.

Practically all such groups have been found to be malarial to some degree and thus are reservoirs of infection. Intermittently, the mountain people come to the settlements to trade for salt or other articles or to work as itinerant farm laborers. This influx of chronically infected people causes continual transmission.

Malaria among the mountaineers has helped to disprove the assumption that malaria cannot be transmitted at heights above 2,000 feet, because of the habits of the principal vector, *Anopheles minimus flavirostris.* Several other anophelines, whose habitats extend to 3,300 or even 5,500 feet, have been incriminated by anopheline dissection.

—JOHN W. MCDOWELL, *malaria control adviser, U. S. Operations Mission, Republic of the Philippines.*

Occupational Health at a University

GEORGE S. MICHAELSEN, M.S.

OCCUPATIONAL HEALTH programs of official agencies have rather consistently overlooked the college as an area where preventive occupational health work could be profitably carried on.

There may be several reasons for this. Perhaps one is that these agencies have been so industry-oriented that they have overlooked the academic staff, other employees, and students of the larger colleges and universities as industrial or occupational groups with which to work. Another reason could well be the prevailing misconception that chemists, physicists, bacteriologists, engineers, and other similar professionally trained people know the potential health hazards of the materials and processes they use. The assumption follows that they also take the necessary precautions to protect themselves.

I can assure you, after working for several years with such professionally skilled personnel, this is definitely not so. Some well-informed persons are outstanding in the real concern they show for their own health and safety as well as that of their colleagues and assistants. But most have not sought information about possible health hazards in their work. I must add, however, that I have found academicians without exception to be a most receptive and interested group ready to accept the facts and willing to cooperate in instituting corrective measures.

Even though our sights are gradually lifting from the strictly industrial to the broader concept of occupational health, the colleges and universities are still being overlooked. Generally, the administrative heads of colleges and universities fail to recognize that the campuses have occupational health hazards and often dangerous situations.

Sponsored research, both basic and applied, is now a multimillion dollar business for colleges and universities, vastly increasing research activities and staffs. At present many scientists are employed solely for research. They have no teaching responsibilities even though they are members of the academic staff. Their laboratories are no different from those in the research department of a large industry.

Campus Health Hazards

A large university campus has all the health hazards of industry and frequently some which have not yet reached the industrial stage. The latter hazards are the most troublesome to the occupational health engineer on the campus. Many times he can make only a wild guess as to the toxic properties of the materials being used, and in such cases he is inclined to be very conservative. At the same time he must not be so stringent in his control measures that it becomes virtually impossible to carry out the research project. To date, such problems at the University of Minnesota predominantly have concerned new agricultural chemicals and the resistance of various materials to chemical action at high temperatures and pressures.

Mr. Michaelsen is associate professor, School of Public Health, and industrial health engineer, university health service, at the University of Minnesota in Minneapolis. *This article is based upon a paper presented at the 20th annual meeting of the American Conference of Governmental Industrial Hygienists at Atlantic City, N. J., April 21, 1958.*

Some idea of the variety and types of occupational health hazards on a college or university campus is indicated by this partial list of those that have occurred at the University of Minnesota in recent years:

- The sergeant in charge of the armory rifle range became ill with lead poisoning. Air sampling revealed atmospheric lead concentrations many times the maximum allowable concentration although only a portion of the range was used. Installation of an extensive ventilating system corrected this hazard.
- Scientists working on particle-size measurement were being overexposed to benzol in a filter cleaning operation. The use of local exhaust ventilation eliminated this hazard.
- Lead and solvent hazards have been studied in the print shop.
- The dangers of welding fumes have been eliminated from the maintenance shops.
- The carbon monoxide content of the air in the university's underground garages has been measured during periods of heavy usage.
- Excessive noise in wind tunnel, in jet engine testing, and in jet fuel combustion research has been evaluated.
- The mercury hazard has been studied in scores of laboratories.
- The misuse of carbon tetrachloride is campuswide and is being studied.
- Potential dangers in handling organic, phosphate-type insecticides in laboratory, greenhouse, and field have been studied.

In most of these problems only a few persons were exposed, which may be somewhat different from the industrial situation. Seldom are exposures to students great enough to cause actual poisoning or impairment of health, but control measures are instituted to alert students to potential hazards and to teach them what control measures are necessary in industry.

Although several institutions have teaching programs in occupational health, so far as I know, only the University of California, the Massachusetts Institute of Technology, and the University of Minnesota have operating functions in this field. Each of these three has a slightly different administrative pattern, undoubtedly dictated by the local situation. Colleges teaching occupational health may give some service within their institutions when called upon, but in general they have no specific responsibility for the control of occupational disease hazards on their campuses.

University Health Service

The University of Minnesota is an autonomous branch of the State government, and all matters of health on its various campuses are a responsibility of the university health service. The Minnesota State Board of Health has therefore officially designated the university health service as a local health department; it is an independent service administratively under the academic vice-president.

The service's division of environmental health and safety was created to cope with the health aspects of water supply, waste disposal, food handling, student housing, swimming pools, radiological health, safety, and occupational hazards. On the staff of the division full time are 1 public health engineer, 1 occupational health engineer, 1 safety engineer, 3 health physicists, and 2 sanitarians, and part time, 2 engineers and a sanitarian. The full-time staff members also have academic appointments in the School of Public Health. This staff may seem large, but considering the size and geographic spread of the institution, it may be too small.

For a program with a wide scope of activities, it is highly desirable to have one or more physicians either on the occupational health staff or closely associated with it. At the University of Minnesota one of the health service physicians is assigned to give special attention to occupational diseases and to medical problems associated with exposure to ionizing radiation.

The University of Minnesota has the second largest enrollment of full-time students in the country, exceeded only by the University of California. In the fall of 1957 about 35,000 students were enrolled on the Minneapolis, St. Paul, and Duluth campuses and an estimated 90,000 a year in all forms of instruction—day, night, and extension classes and correspondence courses. To serve the student body the university employs about 10,000 people, 3,500 of these full-time academic staff members.

The bulk of the instruction is carried out on the three campuses. There are also 5 agricultural experimental stations and schools in outlying parts of the State; an 8,000-acre center for all types of research 25 miles south of the Minneapolis campus; a 2,000-acre wildlife preserve 25 miles north of the St. Paul campus for research on wildlife, forests, lakes, and streams; and a number of smaller stations and research facilities.

Three factors of the division's administrative arrangement we feel are highly desirable. First, the occupational health engineer is a part of a professional team. Close association with the radiological health and safety personnel is particularly helpful to him because occupational health problems frequently involve these fields. Occupational health and safety are very closely allied; in fact, it is often difficult to distinguish between them. Having specialists in both these fields on the same team rather than in different departments, where overlapping activities and contradictory recommendations might occur, is especially advantageous.

For example, the safety engineer was asked to consider the safety hazards of using solvents in a cryostat, a refrigerated, box-like apparatus employed to carry out laboratory procedures at extremely low temperatures. The operator uses insulated gloves mounted in the wall of the apparatus. Neither the motor-driven fan nor the electric lights inside it are explosion proof. From a safety standpoint, it would be hazardous to use solvents in this cabinet unless the temperature is maintained at all times below the flashpoint of the solvent. From an occupational health standpoint, the cryostat is a good device since the hazardous operation is fully enclosed.

The safety engineer is inclined to recommend that this work be done in a large walk-in freezer where it would be virtually impossible to create an explosive mixture. The occupational health engineer is inclined to veto this recommendation because of the dangers of inhaling solvents in a confined, unventilated space.

In this case, the conflicting interests were worked out by agreeing not to use solvents with combustible vapors in cryostats and by providing adequate ventilation in the walk-in freezers. If these two engineers had been in different departments, such a compromise might have been made only after some misunderstanding and delay. In our case the conflict was resolved in minutes.

A second strong feature of the administrative plan is the academic appointments with teaching responsibilities of our staff members. Teaching occupational health forces us to be aware of all new developments, and working in an operating program provides us with a wealth of illustrations, examples, and demonstrations to use in the classroom.

The third feature is the division's close association with the medical staff of the health service which serves the staff and students. The medical staff members are alert to possible environmental factors of illnesses that come to their attention. For example, a student with severe headaches came to a staff physician. After detailed questioning, the physician was satisfied that the headaches were associated with the home environment. The occupational health engineer found 400 ppm carbon monoxide in the flue gases being discharged into the student's apartment by a gas refrigerator.

Several mercury and solvent hazard studies have been initiated at the request of physicians who have suspected such poisoning in students and laboratory workers seeking medical attention. The results of a survey of occupational health hazards on the campus have enabled the industrial health engineer and the physicians to advise the university's civil service department on the proper placement of a maintenance worker who suffers from certain specific allergies. Such requests for assistance and referral of problems would not be as frequent if the occupational health engineer and the physician were not in the same department.

A university occupational health program has all the usual elements of prevention, including preplacement and periodic physical examinations, evaluations of possible occupational health hazards, and recommendations for the corrections needed.

Survey of Hazards

One of its most profitable phases is a room-by-room survey of the entire campus for occupational health hazards. The broad activ-

ities of the division of environmental health and safety mean we survey much more than the usual hazards. We include the following areas:

Fire and accident prevention. Adequate provision of gas masks, protective clothing, fire blankets, safety showers, illumination, first aid kits, and fire extinguishers.

General sanitation. Availability of eating accommodations and building incinerators, insect and rodent control, plumbing defects, and refuse disposal.

Animal care. Types of animals used, source of supply, isolation procedures, evidence of ectoparasites, cage cleaning methods, type of bedding, and disposal of solid wastes and dead animals.

Radiation hazards. X-ray machines, sealed or unsealed radionuclides, and other sources of ionizing radiation.

Building safety. Adequate exits, handrails, and stairways; guarding of machinery; grounding of electrical equipment; and the handling, storage, and disposal of flammable solvents.

The survey provides an unusual opportunity for the occupational health engineer to get acquainted with the institution and for the various branches of the university to become familiar with this health service function.

The occupational health engineer also reviews all plans for new buildings and major remodeling of older buildings at the university. At present, 48 such projects are in various stages of planning and building. These provide him with an unusual opportunity to recommend the proper ventilation to protect the health and welfare of the occupants, to review the need for process or special ventilation, hoods, safety showers, and fire extinguishers, and to check for adequate means of egress. The occupational health engineer also serves as consultant to the space allocations committee of the university, advising on health and safety considerations in the assignment of building space for various shops and research projects.

If it is to serve to its fullest capacity, a university occupational health program must be concerned with problems beyond those considered strictly health matters such as fire prevention and disposal of solid and liquid wastes which are combustible or toxic or both. The occupational health staff does not necessarily have to operate such programs, but should have an intimate working relationship with the persons responsible.

In other institutions where environmental health is not interpreted as broadly as at the University of Minnesota, to establish close-working relationships between the occupational health personnel and those responsible for other environmental problems would be highly advantageous. I urge those of you in the occupational health programs of government agencies to visit the colleges and universities in your area and offer to survey their facilities for occupational health hazards. You will find that you can assist them with a number of problems and you may find that they can help you with some of yours.

Progress in Reporting Mental Hospital Statistics

Eighth Annual Conference of Mental Hospital Statisticians Sacramento, Calif., May 7–9, 1958

A CAREFUL REVIEW and revision of definitions of terms describing the movement of mental hospital patients, refinement of cohort studies of admissions to mental hospitals, and a study of the socioeconomic characteristics of admissions to facilities for the mentally ill in relation to corresponding characteristics of the general population were major topics discussed at the Eighth Annual Conference of Mental Hospital Statisticians.

The conference, held in Sacramento, Calif., May 7–9, 1958, was sponsored by the National Institute of Mental Health, National Institutes of Health, Public Health Service. In attendance were delegates from 19 of the 20 States which are members of the Model Reporting Area for Mental Hospital Statistics (see box insert).

Observers from Massachusetts, Oregon, South Carolina, and Tennessee, and from the Veterans Administration were also present. Other guests represented Great Britain's General Register Office, Canada's Bureau of Statistics, the American Association on Mental Deficiency, the Joint Information Service of the American Psychiatric Association and the National Association for Mental Health, the Mental Health Project of the Western Interstate Commission for Higher Education, and the Public Health Service office of Region IX.

This report was prepared by the Hospital Studies Section, Biometrics Branch, National Institute of Mental Health, Public Health Service, Bethesda, Md. For a short account of the establishment and objectives of the Model Reporting Area referred to in this report, see Public Health Reports, October 1956, p. 1033.

Revision of Definitions

Uniform definitions of basic terms describing the movement of mental hospital populations have been in use by the members of the Model Reporting Area since 1952. While the use of these definitions has resulted in a greater degree of interstate comparability of data based on them, statisticians have found that these definitions lead to inconsistencies both within and between States. Consequently, a committee on definitions, appointed at the Seventh Annual Conference, recommended several changes, the most notable of which pertained to the definitions of first admission and transfer.

Until now, a first admission was defined as a patient who had not previously been admitted to a public or nonpublic hospital authorized or recognized for the treatment of mental disorders. Public hospitals include those operated by a State, city, county, or Federal agency. Nonpublic hospitals include those authorized or recognized for the treatment of mental disorders by a State mental hospital authority. The committee recommended that since there is considerable variation in the criteria used by these authorities in determining authorized or recognized hospitals it would be more appropriate to classify admissions by their type of previous hospitalization for mental disorders. The following classification of admissions to public mental hospitals was proposed by the committee and accepted by the conference:

1. No prior admission to any inpatient psychiatric facility.

2. Prior admission to an inpatient psychiatric facility in the State system, to which the patient is now being admitted, in the following categories: (*a*) State and county hospitals, (*b*) institutions for the mentally defective, and (*c*) psychopathic hospitals.

3. Prior admission to other inpatient facilities as follows: (*a*) State psychiatric facility in other States, (*b*) Veterans Administration hospitals, (*c*) private mental hospitals, and (*d*) all other inpatient psychiatric facilities, including psychiatric services of general hospitals.

Under this definition, patients who have until now been considered first admissions because their inpatient experience occurred in hospitals not listed in the register will be classified as having had prior admissions to such hospitals. This definition will provide a greater amount of information than the current one and will permit a more meaningful comparison of admissions to the State mental hospital systems.

The committee on definitions also proposed that the definition of "transfer" be revised to take into account the increasing interchange of patients between hospitals for the mentally ill and institutions for the mentally defective. Transfers would continue to be defined as movements of patients between hospitals within a single State system without a break in custody, but the State system would be redefined to include public mental hospitals (exclusive of Veterans Administration hospitals) and public institutions for mental defectives within the State. This proposal was also approved by the conference.

Model Reporting Area States

Representatives from the following States are members of the Model Reporting Area for Mental Hospital Statistics.

Arkansas	Louisiana	Oklahoma
California	Michigan	Pennsylvania
Connecticut	Minnesota	Texas
Illinois	Nebraska	Virginia
Indiana	New Jersey	Washington
Kansas	New York	Wisconsin
Kentucky	Ohio	

Cohort Studies

Eleven of the States in the Model Reporting Area submitted data showing the proportion of patients released from, dying in, or retained continuously in public mental hospitals within the first 12 months following admission. Based on these data and on statements submitted by each of the 11 States concerning the laws, policies, and other factors which may affect admission or release from the public mental hospitals in their States, a draft of a monograph was presented at the conference for discussion.

The monograph had four major objectives: first, to illustrate the mechanics and difficulties of conducting a study that requires careful definitions and analysis and the cooperation of 11 independent governmental organizations, widely separated geographically; second, to present data on the probabilities of release, death in the hospital, or continuous residence in the hospital for specified periods of time following first admission in different State mental hospital systems; third, to discuss the problems in interpreting interstate comparisons of these data; and fourth, to delineate the types of data, methodology, and special studies needed to obtain more meaningful interstate comparisons. Thus, considerable emphasis was placed in the monograph on the limitations of the data and the problems inherent in their interpretation.

The conference members agreed that the monograph would be a valuable reference for people working in the mental hospital field, that the draft be submitted for approval to the commissioners of mental hygiene of the 11 States, and that it be published as soon as possible.

A proposal was presented to the conference for a more detailed cohort study in which members of the Model Reporting Area might participate. Based on the experience gained in the monograph study, the cohort research would involve: (*a*) a more precise definition of the starting cohort in terms of previous psychiatric care, type of commitment, and date of admission; (*b*) stratification of patients in the cohort by marital status, age, sex, mental diagnosis, and urban and rural residence; (*c*) development of specific criteria for classification of patients at time of release; and (*d*) followup

of released patients to determine the probability of their return to the hospital within specified periods of time following release. The conference members agreed that each State should submit a protocol of cohort studies which it is conducting or plans to conduct. A committee will then review these protocols and prepare a study design, conforming to the four criteria above, which could be carried out by as many of the States as possible. Such a protocol would be presented for consideration at the next annual conference.

Socioeconomic Studies

The possibility was discussed of conducting studies which would relate the socioeconomic characteristics of patients admitted to psychiatric facilities to those of the general population, as revealed by the 1960 population census. The primary objective would be to determine the extent to which various socioeconomic groups use the different psychiatric treatment facilities within a State.

It was hoped that some States would study the socioeconomic characteristics of those admitted to all types of psychiatric facilities and that other States might at least carry out more limited studies on patients admitted to only specific facilities, such as public mental hospitals.

One important aspect of the proposed socioeconomic study is the acquisition of basic information about each member of the patient's family. Similar data about the general population is obtainable from the Bureau of the Census. With these two sets of data, one may analyze family composition in relation to admissions to psychiatric facilities and determine rates of admission among families with specified characteristics.

Death Rates

Preliminary findings of a study of deaths among mental hospital populations were presented. This study was based on data submitted by the Model Reporting Area States in 1955. It compared age-specific and age-adjusted death rates from various causes among mental hospital populations in specific diagnostic categories with corresponding rates for the general population. The data indicated that the death rates were considerably higher in the hospital populations than in the corresponding general populations.

One of the major difficulties this study faced was the choice of a suitable denominator for the computation of hospital death rates. Two types of rates were computed: a central rate using the average number of resident patients as a denominator, and a terminal rate using an estimate of the number of patients under treatment during the year as a denominator. Each of these rates answers a slightly different question. The most serious disadvantage of the central rate is that in certain patient groups it could exceed unity. The disadvantage of the terminal rate is that the reporting of data on the annual movement of populations in mental hospitals is not sufficiently complete to provide an adequate count of the number of patients under treatment during the year.

A new study of mental hospital death rates was therefore proposed which would be conducted during a period centered around the 1960 population census. Attention would be focused on only certain mental diagnostic groups and certain causes of death, and data would be collected over a 3-year period to insure stability of the resulting rates. Representatives of several States expressed interest in this study and it was agreed that details would be worked out during the year.

Statistics in Canada and Great Britain

Delegates from Great Britain and Canada described their mental health statistics programs and compared their problems with those in the Model Reporting Area. They expressed the desire to obtain international comparability of mental health statistics, but it was generally agreed that the first step will be to obtain comparability within each country.

Other Problems

In view of the interest in staffing patterns of mental hospitals, the conference recommended that the forms currently used for reporting personnel data be revised so as to include fewer

and more specific categories of personnel and data on turnover of personnel which would show the number employed at the beginning of a year, the number added during the year, the number leaving employment during the year, and the number employed at the end of the year. It was further proposed that State personnel officers assist in formulating the necessary classifications and definitions.

Statisticians find that interpreting interstate comparisons of expenditure data is complicated by differences in accounting procedures among States. For this reason, a committee was appointed to work with State finance officers and the Council of State Governments, which is also considerably interested in clarifying this matter in order to develop more meaningful reporting of expenditure data.

In a discussion of the interpretation of trends in the population movement of public mental hospitals, it was pointed out that existing data on population movement do not indicate the specific groups of patients in which changes are occurring, nor do they permit an analysis of changes in relation to possible causative factors.

With this as background, a proposed form was examined for the annual reporting of population movement according to age, sex, length of hospital stay, and two diagnostic groups: schizophrenia and diseases of the senium. This form permits an analysis of changes in population movement within groups defined simultaneously by the four variables. While some of the representatives indicated that these tabulations would require changes in their existing procedures, most of them agreed to prepare them on a trial basis after certain modifications in the form had been made.

Regional Meetings

A report was given covering the proceedings of the Third Midwest Conference on Mental Health Statistics, held in Lansing, Mich., on October 2 and 3, 1957. The first three meetings of this group were aimed primarily at developing interstate comparability of mental hospital data in the midwest. At the third meeting it was suggested that it would be desirable to conduct some small-scale research projects on a regional basis. Accordingly, a committee was appointed to develop suggestions for such projects and to present these plans at the next meeting of the group in October 1958.

CDC Courses in Environmental Health

The following courses in environmental health will be offered at the Communicable Disease Center, Atlanta, Ga., during 1958–59:

Epidemiology and control of milkborne diseases. October 20–24. Review of epidemiology, emphasizing its use in the control of milkborne diseases. Epidemiology problems will be presented to the class for solution.

Milk pasteurization controls. November 12–14. Instruction in principles and control of milk pasteurization and demonstration of testing procedures, with the class responsible for the testing. Fieldwork will be performed on full-scale operating equipment.

Milk sanitation—operational. February 9–20. Comprehensive coverage of health and sanitation problems in the safe handling of milk and milk products, designed for public health personnel administering such programs.

Epidemiology and control of foodborne diseases. May 25–29. A multidiscipline course emphasizing epidemiological principles in the control of foodborne diseases. The class will work in groups and use a team approach to solve an epidemiological problem.

No tuition or fees will be charged for these courses. Priorities for admittance must be restricted to qualified personnel because the size of each class is limited. All applications must be received at least 2 weeks before the course begins.

Application blanks and further information may be obtained through local and State health departments, Public Health Service regional offices, or by writing to Chief, Communicable Disease Center, Public Health Service, 50 Seventh Street, N. E., Atlanta 23, Ga.

Concepts in the Prevention of Hepatitis

The following remarks on hepatitis are quoted from a panel discussion in the Proceedings of the Third Conference of the Industrial Council for Tropical Health, April 16–17, 1957, published by the Harvard School of Public Health this year.

Dr. Geoffrey Edsall: I did not get a clear picture with regard to our working concepts of the prevention of hepatitis. I know perfectly well that any working concepts, other than the waterborne outbreak in Delhi and a few other similar bits of evidence, might be just as vulnerable as some of the theories and practices that Dr. Thomas C. Chalmers outlined. But for something to go away with, I would like to propose this if only in order to see it knocked down: Assuming the control of hepatitis is essentially identical with the control of dysentery—that is, putting it in the simplest possible language, if it were a fecal disease, transmitted by water and other related mechanisms—could it be prevented by exactly the same types of sanitary approaches? I have stated this arbitrarily, in order to provide a target, and I would be interested in the comments of the panel.

Dr. John R. Paul: I wish I could dispose of this in a few plain words. Let us assume that the same principle may be followed. There are, however, a number of points that might be different. For instance, you mentioned the epidemic in Delhi, India, where a member of our department was fortunate enough to be present. This alert person in the water supply division realized that sewage was getting into the water supply, so he did all the things he knew to prevent a catastrophe; namely, he stepped up the chlorine to—I can't give you the figures—levels which normally should take care of bacterial infections. I'm not sure that it would take care of everything, but this was singularly effective, it would seem, in preventing any outbreaks of dysentery and typhoid in the city.

Anyway, the water supply suddenly had become 50 percent sewage. The chlorination was effective in that there were no outbreaks of typhoid fever, but was singularly ineffective in preventing hepatitis. It would seem as if this high percentage of chlorine had killed off most pathogens, if not all of them, but had not a lethal effect on hepatitis virus.

The other feature that might possibly be emphasized, in which this might differ from the control of the enteric diseases we mentioned before, is that this is a virus highly resistant to heat. When it comes to boiling water or washing utensils or cleaning mess kits, my guess—although no better than anyone else's—is that it does seem that a little more vigorous heat treatment seems to be indicated than would normally take care of other agents.

Dr. Edsall: I am glad you brought out the quantitative differences. I didn't phrase my statement right. The qualitative differences were the same, but as you pointed out, quantitatively we are dealing with a much tougher agent to kill.

Dr. Rodney A. Yoell: Some of this has undoubtedly arisen or originated from the practice of doctors who give vaccinations for travel agencies. They use the multiple-dose vaccine. In other words, they buy the 10-dose typhoid and 10-dose cholera in bottles. I checked up about 20 of them, and only 3 were autoclaving their needles. I am wondering if something couldn't be put in the serum or vaccine as a warning or a preventive. Apparently it gets into the vaccine and stays there, because these people get vaccinated, then they come to San Francisco, and just before they get to Japan, they have the virus.

Chairman John C. Snyder: I think you have called attention to the importance of adequate heat sterilization, and this really deserves emphasis. I am sure that there are numerous examples that all of us could draw upon, pointing up this feature.

Reflecting the profound changes in therapy of the past decade, treatment of tuberculosis patients is shifting from the specialized to the general hospital. According to a VA physician, the trend is to be encouraged, for general hospital treatment not only is feasible but may be conducive to improved care.

Treatment of Tuberculosis in a General Hospital

WILLIAM B. TUCKER, M.D.

FOR ABOUT 75 years tuberculosis patients requiring hospital treatment have received care primarily in hospitals specializing in the treatment of this disease, usually designated as sanatoriums. As the result of the impetus given the sanatorium movement in the Adirondacks, by Dr. Edward Livingston Trudeau, the public came to associate treatment of tuberculosis with presumed benefits of the geographic location of sanatoriums. Ironically, it has now been established that it is not the geography or climate of such institutions that is beneficial, but other aspects of their treatment programs, principally close supervision by those familiar with the disease and a certain degree of rest and regularity of routine. It is now apparent that the results obtained in sanatoriums could have been achieved quite as well in general hospitals or in specialized tuberculosis hospitals located in cities and associated with general hospitals.

Recently, following profound changes in the treatment of tuberculosis, there has begun a trend toward care of tuberculosis patients in general hospitals. The majority of sanatoriums, built during the great wave of providing tuberculosis beds in the early decades of this century, remain geographically isolated to a considerable extent. Modern communications have narrowed the gap in distance and time between sanatoriums and medical centers, but relatively few tuberculosis hospitals are integrated parts of centers providing complete medical care.

It is difficult to estimate how many patients now are receiving care for tuberculosis in general hospitals. The directory of tuberculosis hospitals and sanatoriums formerly published by the National Tuberculosis Association every 3 or 4 years, which could be a source for such information, has not appeared with figures later than those for 1953. There are no plans for publishing another directory in the immediate future because the picture is changing so rapidly that any tabulation would be out of date before it came from the presses.

Nevertheless, let us consider such figures as are available for the United States. By 1953 or 1954, the period of peak demand for tuberculosis hospitalization, there were 108,000 tuberculosis beds in the United States. (In all these figures I am excluding beds for tuberculosis in mental hospitals or penal institutions,

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for in these the individuals would remain as charges regardless of their tuberculosis.) At the turn of the century, when there were 200 deaths per 100,000 population, there were less than 10,000 tuberculosis beds, or 1 bed for each 18 annual deaths. By World War I the number of beds had reached 50,000, a ratio of 1 bed for each 3 annual deaths. Many of us remember the drive of the 1930's and 1940's to have enough beds for a ratio first of 2 beds per annual death, then 2.5, and finally 3, in all States. As progress was made in avoiding tuberculosis deaths, the number of deaths declined from 165,000 early in the century to 100,000 in the middle 1920's, to 50,000 in the middle 1940's, and to 20,000 in the middle 1950's (in spite of great population growth), and the ratio of beds to deaths finally reached 5 : 1 for the Nation and more than 10 : 1 in many States.

During all of this period the majority of beds for tuberculosis were in sanatoriums. In 1953, 92 percent of the 108,000 beds were so located.

Furthermore, the majority of the 9,000 tuberculosis beds in general hospitals were there for certain specific limited purposes, not for routine long-term care. The Index of Hospitals and Sanatoria With Tuberculosis Beds, published by the Public Health Service annually in recent years, is sprinkled liberally with the following kind of footnotes for general hospitals listed as providing care of tuberculous patients: diagnosis only, surgery only, diagnosis or short-term care only, temporary hospitalization only pending transfer, less than 5 tuberculosis beds, all patients are transfers in for rehabilitation, takes only ambulatory patients, and no specific number of beds set aside for tuberculosis.

Because data for the United States as a whole are difficult to obtain in recent years, I shall turn to the experience of the Veterans Administration. Since World War II the VA has cared for approximately one-tenth to one-eighth of all the tuberculosis patients of the country, roughly the same proportion as the ratio of veterans to total population. In 1954, the year of peak demand, there were 14,200 beds for treatment of tuberculosis in hospitals, excluding 2,300 for the care of the psychiatric tuberculous. Of these 14,200 beds, 8,200, or 58 percent, were in tuberculosis hospitals, the remainder being in general medical and surgical hospitals.

Prior to World War II a far higher percentage were in tuberculosis hospitals. The fortuitous coincidence of the opening of a number of new VA general hospitals with a greatly increased demand for tuberculosis care among veterans immediately after the war permitted the establishment of many units or sections for tuberculosis patients in general hospitals. Furthermore, the lessening of the demand for beds since 1954 has made it possible to effect adjustments generally favoring locations where more complete medical care is available. By 1957, the VA had approximately 11,600 beds for tuberculosis patients (other than in mental hospitals). Of these, 5,200, or 45 percent, were in general hospitals. The trend is continuing in the VA, and it probably will not be many years before more than half of the veterans requiring treatment for tuberculosis in VA hospitals will receive it in general hospitals.

These gross figures, moreover, do not tell the whole story. Just as an increasing proportion of the care of the tuberculous is being provided in what are officially designated as general hospitals, so have officially designated tuberculosis hospitals in the VA increasingly become in fact general hospitals. There is an almost continuous spectrum among the 173 VA hospitals, with respect to beds for tuberculosis, from 100 percent for nontuberculous conditions to 100 percent for tuberculosis. In fact, if the 4 VA "tuberculosis hospitals" in which more than 50 percent of the patients have nontuberculous diseases are added to the VA's general hospitals, these hospitals in 1957 cared for more than half the VA's total tuberculosis patients (6,000 out of 11,600 beds).

Reflection of Treatment Changes

What does this changing picture with regard to where patients with tuberculosis are cared for reflect?

It reflects the most rapid changes in the treatment of tuberculosis since it was established 75 years ago that tuberculosis is generally a curable disease. Treatment methods have changed drastically since the discovery of

specific drugs. Streptomycin has been generally available for 11 years; isoniazid for less than 6. Yet it was not until about 4 years ago that the clear superiority of prolonged drug treatment, replacing many other forms of therapy, was established.

Nearly everyone is aware of the declining demand for tuberculosis beds in the United States and of the closing of many sanatoriums, including Trudeau Sanatorium, the bellwether of them all, a few years ago. What is not so generally realized is that the number of individuals requiring treatment has diminished very little, or not at all, in recent years. In the Veterans Administration, for example, there was no decrease in the last 3 years in the number of veterans admitted to VA hospitals for treatment of active tuberculosis: there was in fact a 2 percent increase. During the same period there was a 16 percent decrease in the average number of patients hospitalized for tuberculosis. These apparently conflicting figures can be explained only in one way: the same number of patients are being treated for a shorter period of time in the hospital on the average. In the VA the average has decreased from slightly less than a year to a little more than 8 months. At the same time, as has been true generally throughout the country, the percentage of deaths has decreased drastically, and the percentage reaching "inactive" stage has increased, so it is clear that the shortening of hospitalization has not resulted in less effective control of the disease.

I shall try briefly to characterize the changes that have occurred in less than a decade.

Bed rest used to be the sine qua non, the essential; today complete bed rest is employed only for the seriously ill patient, and much more freedom of physical activity within the hospital is permitted, and even regarded as beneficial.

Collapse therapy, such as pneumothorax, thoracoplasty, and pneumoperitoneum, was once widely employed; today these procedures are relied upon less and less, with resectional surgery playing a more prominent role.

Formerly the return from a period of severely restricted activity to a more or less normal life was prolonged and gradual, usually extending, in the hospital and out, over a period of several years; furthermore, many individuals were advised permanently to change their occupation. In contrast, today the transition from hospital to full-time activity can be much more rapid, and it is seldom that a change in occupation, even for manual laborers, is indicated.

The principal element permitting these changes has been the effective use of drugs. (The preceding applies primarily to the care of patients with pulmonary tuberculosis. Patients with certain other forms of tuberculosis, as of the kidneys or the bones, also fit this pattern, but need supporting consultant services to a greater extent.)

When we speak of general hospitals, we usually think of private hospitals where the majority of care is for relatively acute medical or surgical conditions, requiring relatively brief periods of hospital care. What may not be generally realized is that in such hospitals rather drastic changes are occurring also. As our population gradually grows older, on the average, it is more susceptible to the diseases described as chronic, which require longer periods of medical care. The need for long-term care has become so acute in many communities that an entirely new movement, the home medical care plan, has arisen to relieve the increased hospitalization demands, principally for the more chronic medical conditions.

Thus it is, in recent years, as a broad generalization, that "acute" hospitals have come to be more "chronic" in the care they provide, while such a "chronic" disease as tuberculosis has come to be more "acute" in its hospitalization requirements. It is principally because of this gradual merging in the function of these two types of hospitals, formerly so divergent, that it is possible for general hospitals to consider caring for tuberculosis patients.

Two other major trends in the field of tuberculosis need to be mentioned. One is the increasing complexity of the medical care of tuberculosis. More tuberculosis patients are in older age groups, susceptible to other diseases of the elderly, so that more access to specialized consultation services is required than formerly. There is much more need for extensive laboratory work, not only that of tuberculosis bacteriology, but also that associated with drug treat-

ment and with the management of related nontuberculous conditions. And, as has been mentioned, there is need for access to the now highly specialized branch of surgery, thoracic surgery, chiefly of the resective, or excisional, type. In brief, the best care of the tuberculosis patient today can be given only where many diverse supporting medical and allied disciplines can be brought to bear. These usually are available in general hospitals. They also have been brought successfully to many tuberculosis sanatoriums through the extensive use of consultants. But clearly the greater the geographic separation the more difficult this integration.

The other trend has to do with the number of physicians interested in the tuberculosis field. It is sad and ironic but true that for many decades a majority of the physicians caring for tuberculosis patients were those who themselves acquired the disease, recovered from it, and were advised to practice the more sheltered brand of medicine to be found within a sanatorium. The control of the spread of tuberculosis has been so great, fortunately, that now far fewer physicians are placed in this position. While accurate figures are not available, it is my impression that the supply of physicians to care for tuberculosis has decreased in recent years at a greater rate than the decrease in the number of patients hospitalized.

The training of physicians has much to do with this decrease. Today it is rare that the internist completing his residency training elects to enter the field of tuberculosis per se. He often is interested in the field of pulmonary diseases, which includes tuberculosis, but he is usually unwilling to limit his practice exclusively, or even to devote a really large part of it, to the care of tuberculosis.

These and other facets of the changing picture of tuberculosis make it almost inevitable that in the future an increasing proportion of the care of tuberculosis patients will be in "general" hospital settings.

Answers to Objections

It has been my experience, in discussing the feasibility of caring for tuberculosis patients in general hospitals, for many individuals to think at first of the difficulties to be overcome. It has also been my experience, in three separate general hospitals, that it can be satisfactorily demonstrated, to hospital administrators, to boards, and to others, that the advantages are real and that potential disadvantages are not in fact as great as they may seem.

One of the first problems to be mentioned, and perhaps the principal one, is contagion. Certainly tuberculosis continues to be a communicable disease. However, of a group of 100 tuberculosis patients, today, with effective drug treatment, only 25 to 40 (depending on how serious is the disease among the patients admitted) are infectious at any time, instead of the vast majority, as formerly. Today the average tuberculosis patients become "negative" in 4 or 5 months or less after the start of treatment. Thus "isolation precautions" are not necessary for the majority of tuberculosis patients. Patients may be separated into "positive" and "negative" groups by rooms or by wards, with isolation precautions restricted to the former and much more freedom permitted the latter.

There is also the associated risk of hospital employees' acquiring active tuberculosis. In the Veterans Administration, some 100,000 hospital employees receive regular X-ray examinations each year. The new tuberculosis case rate among them has been declining progressively in all VA hospitals, but the important thing to report is that the risk is not greater, in the VA, in tuberculosis hospitals than in general hospitals. Furthermore, among about 60 general hospitals in the VA caring for tuberculosis patients, in which the percentage of patients hospitalized for tuberculosis ranges from less than 5 percent to more than 40 percent, there is no statistically significant relationship between percentage of tuberculosis patients and rate of development of active tuberculosis. There is some risk in working in any hospital, although the risk is declining, especially as the practice of X-raying hospital patients on admission, to detect the unknown infectious case, spreads. The essential points are that the risk of hospital employees' acquiring tuberculosis is not greater in general hospitals caring for tuberculosis patients than in general hospitals not caring for them and that

it is not less in general hospitals than in tuberculosis hospitals.

A separate study made in the Veterans Administration reveals that volunteers working in VA hospitals, whether with or without tuberculosis patients, run essentially no risk of getting active tuberculosis. Among 20,000 examined last year, not a single new case was found.

A number of other problems in hospital management associated with the contagiousness of the disease deserve brief mention. It was once thought that many hospital facilities could not be used in common by tuberculous and nontuberculous patients. It is now known that much less duplication is necessary than was formerly thought. Studies of library books used by infectious tuberculosis patients have not shown that they are carriers of tuberculosis germs. Separate dishwashing facilities are not necessary if proper precautions are taken in preparing dishes for washing and the washers are properly operated. Separate dental and ear, nose, and throat units do not need to be established if tuberculous and nontuberculous patients are treated at separate times and if instruments are carefully disinfected. Patients with infectious tuberculosis may safely be transported to the hospital laboratory facilities or to the X-ray department by carrying out simple and effective isolation precautions. Letters written by tuberculous patients may safely be dispatched. With moderate safeguards infectious tuberculosis patients may enjoy the privileges of hospital stores or canteen services.

These statements do not, of course, suggest that all isolation precautions may be abandoned. Quite the contrary; they are made on the assumption that such precautions are carried out meticulously when indicated, for the "positive" patient. Wearing of gowns and masks, handwashing, restriction of infectious patients to certain geographic areas, special techniques for disposal of infectious waste materials, special handling of contaminated laundry, and other special techniques continue to be needed. But it has been established that these measures do not introduce insuperable obstacles. And when these relatively minor inconveniences are balanced against the greater advantage to the tuberculosis patient of having direct and immediate access to all the facilities of the general hospital, increasingly there is recognition that the general hospital can, and probably should, share in the care of tuberculosis patients.

One more aspect of hospital care for the tuberculosis patient should be considered, that is, rehabilitation. First, as has already been implied, extensive rehabilitation is required not nearly to as great an extent as formerly; second, retraining of tuberculosis patients for new professions or occupations is now seldom indicated; and, third, "on-the-job" training, if indicated, can now occur after a relatively short period in the hospital, while the patient is still under close medical supervision on an outpatient basis and while he is continuing to take drugs.

However, certain elements of what is commonly called rehabilitation are still desirable for tuberculous patients. While necessarily hospitalized, they need (*a*) diversion, (*b*) an opportunity to study if they so desire, and (*c*) entertainment. Fortunately most of these needs can be supplied through the voluntary services available to most general hospitals, and rehabilitation counselors in many States are glad to work with the staffs of local hospitals. In brief, the so-called rehabilitation needs of tuberculosis patients have now become less exacting and generally can be encompassed within the framework of the general hospital.

Conclusion

I have tried to describe broadly the changing pattern of hospital treatment for tuberculosis in the past decade; to indicate some of the reasons why general hospital treatment for tuberculosis is not only feasible but may be conducive to improved medical care; and to indicate some of the problems. Nothing I have said is to be construed as indicating that excellent care cannot be given in a tuberculosis hospital or sanatorium specializing exclusively in the care of the tuberculous. It can be, but it is more difficult. What I have tried to outline is the feasibility of the general hospital's participating in the treatment of tuberculosis patients.

I shall close by gazing a little into the future. The time will come, I feel sure, when the average, well-trained physician is as well trained in tuberculosis as he now is in cardiac or digestive disorders. The time will come, I am confident, when individuals with active tuberculosis—constantly diminishing in number—can be cared for by such a well-trained physician in a general hospital, small or large, in their home communities.

The time of course may come when we shall not have to worry about treating tuberculosis at all! But I cannot envision that event in the predictable future. Tuberculosis remains the No. 1 infectious disease in this country. I do believe that the general hospital will play an increasingly prominent role in its control, but only if the current sound medical and public health principles continue in force. Care in the general hospital will, for a time, supplement other tuberculosis control measures; ultimately it may become the mainstay of our efforts.

Seminars in Dental Public Health

Seminar courses in public health dentistry for dentists employed full or part time in local public programs have been the major activity of the dental public health unit established at Harvard University in December 1956. An initial course, lasting from January through May 1957, consisted of 10 two-hour sessions. For the 1957–58 academic year, the course was expanded to 18 two-hour sessions over a 9-month period.

The Harvard dental public health unit is an outgrowth of efforts by the division of dental health of the Massachusetts Department of Public Health to provide assistance in public health dentistry for the more than 200 independent local dental health programs in the State. Located at the Harvard School of Dental Medicine, the unit is directed and staffed by Harvard faculty members. It receives financial support and consultative service from the State health department.

Following an introductory session on public health, the course covers such subjects as biostatistics, epidemiology, fluoridation, nutrition, health programs in relation to cultural patterns, health education, organization of medical and dental care, and dental program planning. All sessions are held in the evening from 7 to 9 o'clock. In addition to the specified number of lecture-discussion sessions, each course has included a visit to a water filtration plant.

Trainees in the first course numbered 11. Nine were selected from among a group of local public health dentists and dental health directors, and 2 came from the Council on Dental Health of the Massachusetts Dental Society. All the participants were awarded certificates of satisfactory completion.

Besides conducting seminars, the Harvard unit offers consultation on technical subjects related to dentistry for public health dentists in local programs and serves as a diagnostic and treatment resource for referred cases presenting medico-dental problems beyond the scope of local resources.

The unit is directed by Dr. James M. Dunning, lecturer on public health dentistry at the Harvard School of Dental Medicine. Faculty members of both the University's School of Dental Medicine and its School of Public Health have taken part in the seminars.

Following this lead set by Massachusetts, the Hartford (Conn.) Health Department is currently planning, under the direction of Dr. Leonard F. Menczer, a similar seminar program to begin in January 1959. Letters have been written to the directors of each of the schools, hospitals, and clinics where dentists are employed to apprise them of the proposed undertaking and to enlist their cooperation. The Greater Hartford Area has some 11 agencies using the services of dentists, and the number of dentists in these agencies may be as high as 50.

publications

Housing Codes—The Key to Housing Conservation. Volume 1. Code enforcement problems and recommendations. Volume 2. Minimum housing standards ordinance. Volume 3. Administrative guide for local programs. *72, 79, and 34 pages, respectively.*

A study of housing codes and their administration in a representative sample of communities in New York State and elsewhere, sponsored and financed jointly by the New York State Division of Housing and the Urban Renewal Administration of the Housing and Home Finance Agency, has resulted in this three-volume report.

Following a summary of the study findings in volume 1, volume 2 sets forth a recommended ordinance establishing minimum requirements for existing housing. The ordinance is intended for enactment by the local legislative body. In volume 3 are recommendations concerning methods of adoption, enforcement, and inspection.

A limited number of copies are available from the Bureau of Community Development, State Division of Housing, 270 Broadway, New York 7, N. Y.

Primer for Paraplegics and Quadriplegics. *Patient Publication No. 1; 1957; 38 pages; 50 cents.*

The nature of paraplegia and the consequent adaptations of normal living that become necessary are described in simple terms. Clothing, diet, and excretory functions of the paraplegic are fully discussed.

A chapter prepared by the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, describes services offered paraplegics through State rehabilitation agencies, giving the broad conditions of eligibility, a general outline of methods, and a discussion of employment prospects.

This manual, the first of a series regarding specific disabilities, is directed to all persons disabled by damage to the spinal cord and to their families. Copies may be obtained from the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, 400 E. 34th Street, New York 16, N. Y.

Animal Disease and Human Health. *Annals of the New York Academy of Sciences; vol. 70, art. 3; June 3, 1958; pages 277–761; $5.00.*

A publication on comparative medicine that should prove useful to the professions of the medical sciences, this series of 40 papers discusses diagnosis, control, and treatment of diseases which can be transmitted from lower animals to man.

The monograph is the result of a conference held by the New York Academy of Sciences in collaboration with the Communicable Disease Center, Public Health Service, Atlanta, Ga., September 11–13, 1957. All papers were prepared by persons well versed in their respective specialties, and the publication was edited by James Lieberman, conference chairman.

Copies may be purchased through the Executive Director, New York Academy of Sciences, 2 East Sixty-third Street, New York 21, N. Y.

Health Statistics From the U. S. National Health Survey—The statistical design of the health household-interview survey. *PHS Publication No. 584-A2; 1958; 41 pages; 35 cents.*

The initial statistical design of the continuing health household-interview survey, which is a major phase of the program of the U. S. National Health Survey, is described. The book contains chapters on background and objectives, summary of structure of the household-interview survey, survey procedures, and sample design.

There are eight appendixes: illustration of content of initial basic household questionnaire, estimating equations, sampling and measurement errors, stratification of primary sampling units, the sampling allocation problem, illustration of drawing PSU's and households into the sample, randomizing assignments, areas, and weeks, and selected statistics about the survey.

Nursing Resources—A progress report of the program of the Division of Nursing Resources. *PHS Publication No. 551; 1958; 43 pages; 30 cents.*

A chart book with text, this brochure describes the changes that have occurred in the practice of nursing during the last few decades and how the Division of Nursing Resources is helping to solve some of the problems created by these changes.

The 20 charts illustrate various aspects of nursing, including the Nation's supply of professional and nonprofessional nursing personnel, their distribution in the population, and their training and utilization.

School Health Services—A selective review of evaluative studies. *Children's Bureau Publication No. 362; 1957; by Bronson Price; 149 pages; 45 cents.*

Significant studies of school health services made during the last 30 years are reviewed in this book. The purpose is to help research workers and professional workers in school health services evaluate current programs and determine future needs.

The studies fall into five major groups, according to the methods employed: use of statistical rates as study criteria, health survey findings, use of expert judgment, developing study samples and reexamining the children, and experimental research approaches. Practically all the studies relate to health services in the elementary schools, where by far the greatest effort in school health services is concentrated.

Rehabilitation of Deaf-Blind Persons—A manual for professional workers. *Vol. 1; 1958; 246 pages; $3.50*

Technical aspects of rehabilitation of the deaf-blind are covered in this

series of papers dealing with problems of communication, social services, general health and sight-hearing, vocational adjustment, and recreation services for the deaf-blind. The principal methods of communication with the deaf-blind, including the recently developed International Standard Manual Alphabet recommended for worldwide adoption, are described and evaluated.

Prepared as an outcome of a 2-year study by the Industrial Home for the Blind and the Office of Vocational Rehabilitation, the manual will be followed by more detailed and technical papers on the same general subjects.

Copies may be obtained from the Industrial Home for the Blind, 57 Willoughby Street, Brooklyn, N. Y.

Bibliography of Medical Reviews. *National Library of Medicine; Vol. 3; 1958; 205 pages; $1.00.*

References to approximately 2,885 review articles, 585 of which are not duplicated in the *Current List of Medical Literature*, are contained in this third volume of the bibliography.

The subject section follows the general pattern of the previous volumes, and the number of references cited in the review article is given in parentheses at the end of the reference. In addition a detailed cross-reference structure and a complete author index are provided.

Health Statistics From the U. S. National Health Survey—Preliminary report on disability, United States, July–September 1957. *PHS Publication No. 584-B4; 1958; 30 pages; 30 cents.*

Estimates of person-days of restricted activity, including days people were confined to bed, stayed home from work, or only cut down on their usual daily activities, are presented in 7 general tables supported by 3 graphs and 18 detailed tables. Explanatory text includes appendixes containing technical notes on methods and definitions of terms.

The number of persons with chronic limitations of activity or mobility is estimated by the degree of limitation. The data are derived from continuing household interviewing carried on for the Public Health Service by the Bureau of the Census.

Research Publications of the National Heart Institute — January 1953–June 1958. *PHS Publication (unnumbered); 1958; 110 pages; 40 cents.*

A listing of scientific papers and abstracts by staff members of the National Heart Institute, this bibliography documents the more recent work in the conduct of their intramural research.

The publications are listed chronologically by year, and alphabetically by senior author, under the name of the research unit in which the studies were performed. The listing thus provides, for scientists and others interested, a record of progress made through investigations carried on at the institute.

State Occupational Health Programs. *PHS Publication No. 605; 1958; 41 pages; 30 cents.*

Abstracts of State program plans for occupational health are grouped by States and regions. This booklet also summarizes major health needs and administrative problems pertinent to occupational health, as expressed by State program directors. Selected administrative information for each State, including placement of responsibility for occupational health in the health department and staff assigned to the program, is shown in tabular form.

Plans prepared by the majority of the States cover a 2-year period beginning with fiscal year 1957. In some States air pollution control activities were included, but these are not described in the abstracts.

The Training Program of the National Institute of Mental Health, 1947–1957. *PHS Publication No. 603; 1958; 65 pages.*

A comprehensive review of the training program at the National Institute of Mental Health during the first decade of operation, this report covers its basic philosophy, a survey of accomplishments during the past 10 years, a detailed description of the training program in 1957 and 1958, and an appraisal of mental health training needs during the next 5 years.

The report also contains a historical account of the development of the program and an analysis of the research fellowship and career investigator programs. In addition, 11 appendixes provide comprehensive analyses of the expenditures for the various training programs with complete information about the relative proportions expended for teaching personnel, trainees, and other items.

Indians on Federal Reservations in the United States—A digest, Portland Area. *PHS Publication No. 615, part 1; 1958; 50 pages.*

Brief summaries of selected information about each Federal Indian Reservation in three States of the Portland Indian Health Area—Idaho, Oregon, and Washington—comprise this digest.

The population groups, their social characteristics, including homes, education, and income sources, and their health status and services are discussed. Included also is a description of the location, ownership, and topography of the reservation land.

Successive parts of this digest will be published, each pertaining to a jurisdictional area of the Division of Indian Health, Public Health Service.

Public Health Nursing Service to Families—A collection of case studies. *PHS Publication (unnumbered); 1958; 145 pages.*

Case studies from official health agencies have been compiled to illustrate the variety of cultural, racial, and economic groups served by public health nurses and the diversity of services provided. Each of the 19 presentations includes a brief description of the family unit, a summary of its medical problems, and a transcript of the nursing notations.

Although this monograph was prepared primarily as an aid for teaching public health nursing concepts and practices to student and graduate nurses, it should be useful also to

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public health nursing supervisors and administrators in evaluating the comprehensiveness of nursing care, analyzing the usefulness of the nursing record, and demonstrating program accomplishments.

Guide to Russian Medical Literature. *PHS Publication No. 602; 1958; edited by Scott Adams and Frank B. Rogers; 89 pages; 40 cents.*

Prepared to assist investigators unfamiliar with the indexing, abstracting, and bibliographic services, this book contains chapters on western sources of information about Russian medical literature, on the Russian systems for indexing and abstracting, on translation activities and services, and on the collections of Russian medical literature in the National Library of Medicine. Three translations of Russian papers on medical libraries and the medical printing industry of the U.S.S.R. are also included.

The guide was prepared cooperatively by the National Library of Medicine and the National Institutes of Health.

The Nation's Health Facilities—Ten years of the Hill-Burton hospital and medical facilities program, 1946–1956. *PHS Publication No. 616; 1958; by Leslie Morgan Abbe and Anna Mae Baney; 181 pages; $1.25.*

Progress in planning and constructing health facilities with Federal assistance through the Hill-Burton program is reviewed. The status of each type of health facility reported by the State plans is given as of July 1956. These plans include nearly all types of health facilities in the Nation except Federal facilities and doctors' and dentists' private offices.

Much new analytical material, particularly for general hospitals in metropolitan areas, general hospital service regions, and psychiatric units in general hospitals, is included. For convenient reference, the book also has limited data for January 1, 1958, in a supplement to the appendix. Eleven charts and 45 tables appear throughout the book.

Sewage and Water Works Construction, 1957. *PHS Publication No. 608; 1958; by William H. Abbott, Kenneth H. Jenkins, and Elsie Gibson; 15 pages; 20 cents.*

Construction contract awards during calendar year 1957 for sewage treatment plants, collecting sewers, and water systems are contained in this report. The tables present data arranged by States, population groups based on community size, and contract size groups.

Directory of State and Territorial Health Authorities, 1958. *PHS Publication No. 75; 1958 revision; 99 pages; 35 cents.*

Revised as of May 1958, this directory lists by State the name of each health department, the officer in charge, the principal organizational units within the department, and the names of officials directing those units. Included also are officials of other State agencies directing grant-in-aid programs of the Public Health Service and of the Children's Bureau grant program for crippled children's services.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

Farmers' Expenditures for Health Care in 1955. *Agriculture Information Bulletin No. 191; by Alvin L. Bertrand and Donald G. Hay; 1958; 33 pages; 25 cents.*

Data collected in the survey of farmers' expenditures in 1955, conducted by the Department of Agriculture and the Bureau of the Census, indicate the items of health care which farm families buy and their expenditures for each.

Average family expenditures and aggregate outlays are tabulated by region and geographic division, and variations are analyzed. The report also examines the relation of health care expenditures to selected socioeconomic factors: economic class of the farm, age of the operator, total living expenses, and family size.

Bibliography of Space Medicine. *PHS Publication No. 617 (Public Health Bibliography Series No. 21); 1958; 49 pages.*

Almost 400 references have been selected for this bibliography from the indexes and catalogs of the National Library of Medicine and from leading aviation, aviation medicine, and astronautical publications. They are arranged in broad subject classes, in inverse chronological order, and alphabetically by author.

The subjects include sealed cabin problems, acceleration and deceleration, fractional and zero gravity, cosmic radiation, survival problems, psychological and social problems, ground crew problems, and extraterrestrial aspects.

Highlights of Heart Progress, 1957. *PHS Publication No. 595; 47 pages; 25 cents.*

Detailed, yet understandable to the layman as well as the professional, this booklet describes program developments and research studies conducted and supported by the National Heart Institute during 1957.

Research findings on 20 subjects in such major heart disease categories as atherosclerosis and coronary heart disease, high blood pressure, and heart failure are reported. Surgery and new knowledge and methods are discussed in the remaining 27 items.

Vital Statistics of the United States, 1956—Mortality data. *NOVS Publication, vol. II; 525 pages; $4.25.*

Twenty tables of final detailed mortality data for 1956 are presented in this volume. The material

is tabulated according to places of occurrence and residence, month of occurrence, color, race, sex, age, and cause for persons in the United States, each State, metropolitan and nonmetropolitan counties, each county, and certain cities.

Volume II of this annual publication is published prior to volume I.

I. Health Insurance Coverage by Age and Sex, September 1956. *Research and Statistics Note No. 13; May 21, 1958; 6 pages.*

II. Characteristics of the Population with Hospitalization Insurance, September 1956. *Research and Statistics Note No. 14; May 27, 1958; 7 pages.*

III. Health Insurance in the Population 65 and Over. *Research and Statistics Note No. 17; June 11, 1958; 9 pages.*

IV. Hospital Utilization by Persons Insured and Uninsured in September 1956. *Research and Statistics Note No. 19; June 23, 1958; 9 pages.*

V. The Relationship of Marital Status to Hospital Utilization and of Insurance Ownership to Methods of Paying for Hospital Care, Year Ending September 1956. *Research and Statistics Note No. 25; July 23, 1958; 9 pages.*

A series on the extent of health insurance protection in the United States prepared by the Social Security Administration, these five notes are based on replies to questions added to the Current Population Survey.

The data have been analyzed by age, sex, race, and marital and labor status. Differences between the uninsured, the insured, and the entire population in these demographic characteristics are examined. Income data are included in the note dealing with the aged.

Copies of the notes may be obtained from the Division of Program Research, Social Security Administration, Department of Health, Education, and Welfare, Washington 25, D. C.

VD Fact Sheet, 1957. *PHS Publication No. 341; 1958; 14th revision; 22 pages.*

Basic statistics on venereal disease incidence, prevalence, and treatment are provided for persons interested in public health and venereal disease problems.

Other statistics relate to the estimated annual cost of uncontrolled syphilis, mortality and insanity caused by syphilis, health department casefinding activities, morbidity by age, effect of syphilis on pregnancy, and incidence of reactions to penicillin in a venereal disease clinic population.

This information supersedes any previously published data.

Refuse Collection and Disposal—An annotated bibliography, 1956–1957. *PHS Publication No. 91 (Public Health Bibliography Series No. 4, Supplement C); by Edward R. Williams; 48 pages; 35 cents.*

The references comprising this supplement have been annotated to facilitate the exchange of information in both the research and operational phases of refuse sanitation. They are arranged in sections which correspond to the various administrative and operational phases of the entire field of refuse collection and disposal.

Communicable Disease Center—Report of activities. *PHS Publication No. 599; 1958; 69 pages.*

A synthesis of the major activities of the Communicable Disease Center for the fiscal year 1956, this report describes the scope, nature, and interrelationships of the Center's cooperation with States and Territories to provide assistance in epidemics and natural disasters; consultations, demonstrations, and program reviews; and laboratory services.

The book is arranged along the broad categories of the Center's pattern of operation. The major portion is devoted to field and laboratory investigations of diseases. Training activities are outlined under four specific headings.

Proceedings, 1957 Annual Conferences—Surgeon General, Public Health Service, and Chief, Children's Bureau, with State and Territorial health officials. *PHS Publication No. 580. 1958. 90 pages.*

The proceedings cover addresses and actions at the three 1957 conferences of the Surgeon General and the Chief of the Children's Bureau with the State and Territorial health officers, mental health authorities, and hospital and medical facilities survey and construction authorities.

Recommendations and resolutions of the participating State and Territorial officials pertain to such subjects as mental health, medical facilities, home accident prevention, patient care in nursing homes, rehabilitation, air pollution, and implications of the social security programs.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared by other Federal agencies.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

ECHOES from Public Health Reports

THE EXPERIMENTAL TRANSMISSION OF POLIOMYELITIS TO THE EASTERN COTTON RAT, *SIGMODON HISPIDUS HISPIDUS*

By Charles Armstrong, *Senior Surgeon, Division of Infectious Diseases, National Institute of Health, United States Public Health Service*

Through the courtesy of Dr. Max Peet, of the Department of Surgery, University of Michigan, we received on August 28, 1937, a sample of brain and cord from an 18-year old boy, one of several bulbar cases of poliomyelitis which occurred at Lansing, Mich., during that summer. A strain of virus was recovered from the material which has now been through 15 monkey passages and which clinically, and pathologically as reported by Surgeon R. D. Lillie, is apparently a strain of poliomyelitis. Neutralization tests with this virus have not been done.

On November 8, 1937, several species of rodents, including a cotton rat received through the courtesy of Dr. A. Packchanian, of the National Institute of Health, were inoculated with a fourth monkey passage of the virus. The cotton rat remained apparently well until the twenty-fifth day, when it appeared nervous and tremulous. On the following day it was paralyzed in both hind legs and was sacrificed.

Pathologist R. D. Lillie, who has made all the pathological studies, reported "polioencephalitis." Eleven cotton rats were inoculated with this strain of poliomyelitis virus during the winter of 1938, of which rat No. 9, inoculated on February 14, became paralyzed in both hind legs 29 days later. Brain and cord emulsion was passed to rat No. 13 and symptoms appeared on the sixteenth day. On the following day there was paralysis [illegible]

SEPTEMBER 22, 1939, pp. 1719–1721

In this paper Dr. Charles Armstrong reported the first successful transfer of the Lansing strain of poliomyelitis to rodents. Later (December 29, 1939, pp. 2302–2305) the strain was passed from the cotton rat to the white mouse.

U. S. GOVERNMENT PRINTING OFFICE: 1958